WIN A £1,100 ROBOT

YOUR COMPUTER

Denmark	DKr.	36.00
France	Fr.	52.50
Germany	DM	9.50
Greece	Dra.	310.00
Holland	DFl	8.90
Italy	L	4300
New Zealand	NZ$	3.70
Singapore	M$	7.20
Spain	Pts.	400.00
Switzerland	SFr.	7.50

£1

MARCH 1985 BRITAIN'S BIGGEST PUTER MAGAZINE Vol. 5 No. 3

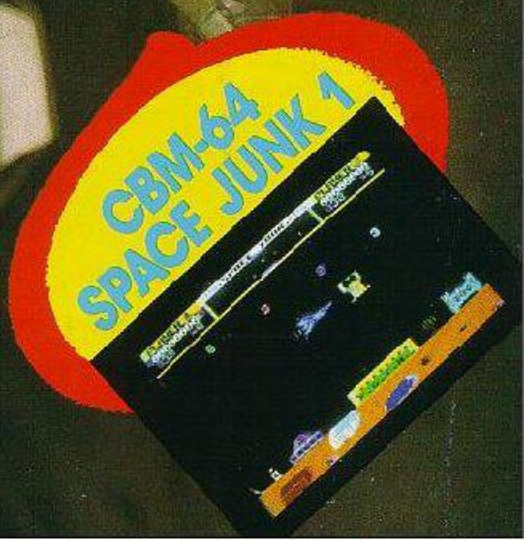
ROBOTS
Take me to your micro

Spectrum Securifile, Speed Basic and Terrapin

Supersprite CBM-64 and Amstrad Artist

Oric Creep Castle and Dragon Wordprof

BBC Bells and Disc Overlays



AUTOMAN
BUG-BYTE
Commodore 64
Officially Licensed from
20th Century Fox
Mulberry House, Canning Place, Liverpool L1 8JB Tel: 051-709 7071

YOUR COMPUTER Contents

MARCH 1985

News — Commodore 128: page 21.

Space Junk: page 46.

Robot competition: page 51.

Cover story — Robots: page 52.

20 NEWS: First pix of Commodore 128 and Atari ST-and XE, Rocky Horror hits Spectrum, Oric wobble, Quick disc, software through your television.

25 LETTERS: Save the Dragon, magic Poke prolongs knights.

29 FIRST BYTES: What is CP/M and how do micros store data?

33 COMPUTER CLUB: Paul Bond has a harrowing experience.

35 HARDWARE HIT LIST: Penman and the Oric modem.

37 SOFTWARE SHORTLIST: Latest commercial software releases — wizards versus lizards, choppers versus brick walls, coal-stealing moles versus prison warders.

45 QUEST CORNER: Hugo North reviews adventure games.

46 CBM-64 SPACE JUNK: Nalin Sharma's mammoth space game.

51 WIN A £1100 ROBOT COMPETITION: Last year we got you to design your dream or nightmare micro — this year create your own Iron Man. Be a Frankenstein.

52 RULE OF THE ROBOTS — TAKE ME TO YOUR MICRO: Investigates the current market for cheap domestic robots linked to home computers.

57 ZX-81 MAD JUMP: Fredrik Ivarson's conveyor belt to hell. Don't bork your head or fall through the gaps in the rollercoaster of micro fun.

59 SPECTRUM TERRAPIN: High resolution movement, colour, sound, graphics — Ian Collier sets out to save terrorised terrapins without turning turtle.

65 BBC AND ELECTRON BELLS: It's for yoo-hoo, Esmeralda. Quasimodo has a chip on his shoulder but Bryan Lewis has a great game for both Electron and BBC computers.

71 SUPERSPRITE CBM-64: Graham Barbour's program runs independently of Basic and provides all the sprite editing facilities you could possibly want.

77 ATMOS CREEP CASTLE: Grotesque graphics, awesome sound. You won't tire of Miles Dunlop's new game — twelve screens and stacks of platforms.

82 DRAGON WORDPROF: Full auto repeat on keys, stores four separate 6144-character files, and fits into only 2K. Simon Tully's word processor for the D-32.

85 ALL ABOUT ADE — AND BCPL: John Dawson initiates you into the rites of two high-level languages.

90 AMSTRAD ARTISTS ONLY: Wai Tsang splashes out on a drawing program for the Amstrad. Offers line drawing, circle plotting and airbrush facilities.

92 SPEEDING UP BASIC: Richard Taylor lashes out at slow Spectrum Basic. Totally user transparent and will work with all Spectrum Basic programs.

97 TELSOFT: Every month at least two of the main programs published in *Your Computer* is available down your telephone line. This month it's BBC Bells and ZX Securifile.

98 EXTENDED VIC BASIC: David Redmond teaches the Vic-20 more words and gives demonstrations.

102 SPECTRUM SECURIFILE: A flexible machine-code data handling program will be developed illustrating many of the points discussed in this article by Jon Ellis.

106 BBC DISC OVERLAY: P. Andrews solves a space dilemma.

110 INVISIBLE ZX-81 TOOLKIT: Stuart Clarke peps up the ZX-81.

114 QL TUTOR: More 68008 assembly language for the Sinclair QL, courtesy of Phil Holliday — not forgetting a brief introduction to QDOS.

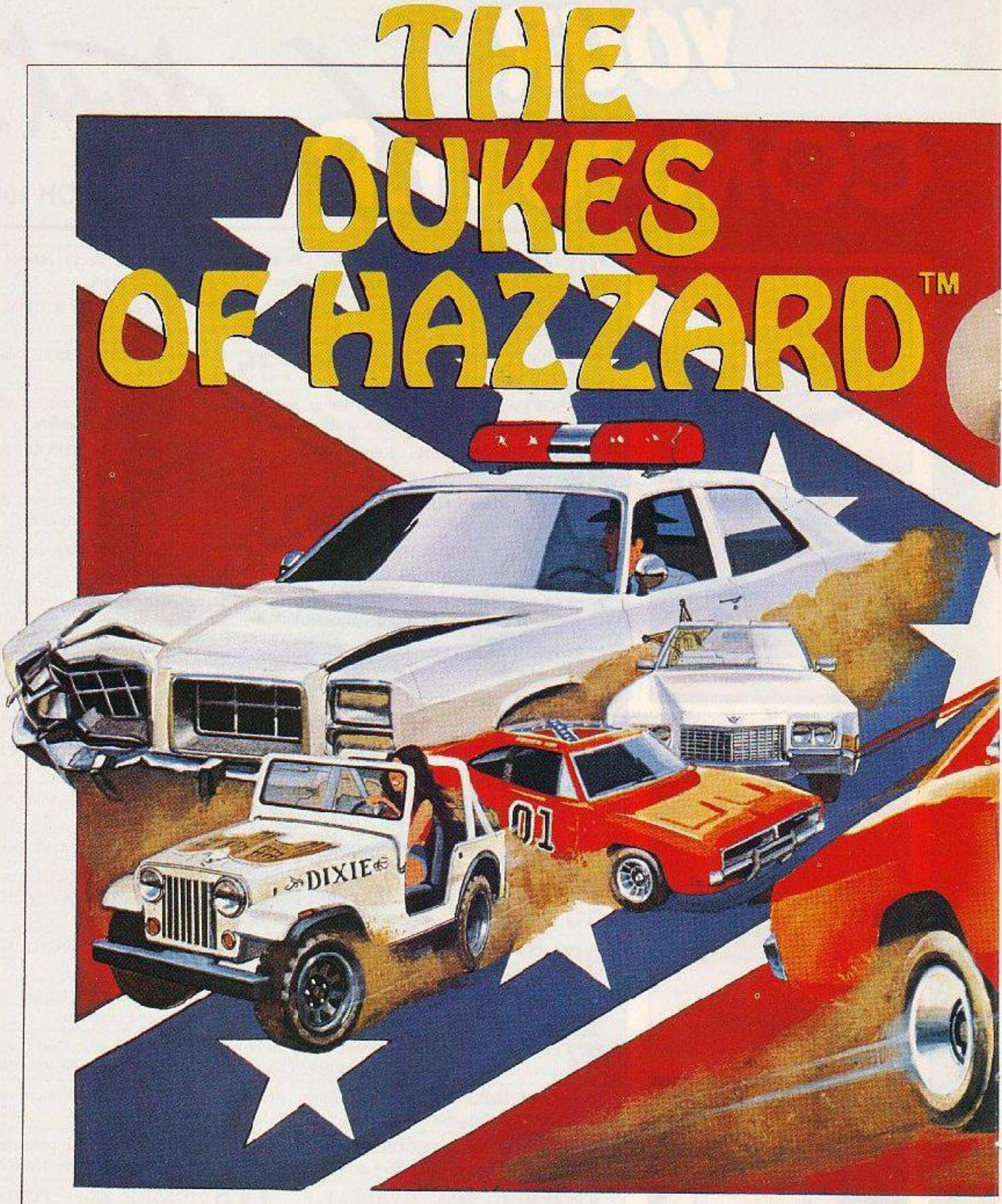
117 FALL GUY COMPETITION WINNERS: A *Your Computer* reader goes to Hollywood. Don't forget about this month's great robot competition, either.

119 RESPONSE FRAME: Tim Hartnell replies to readers' queries.

121 SOFTWARE FILE: Ten pages of software for most micros.

130 INDEX: Continued from last month.

146 DATEBASE: Paul Bond rounds up micro events.



That old villain sheriff Boss Hogg is up to his tricks again. The Dukes still owe him $5,000 which they borrowed to buy some new farm machinery. Sheriff Hogg wants the money repaid, and he's told the Dukes that unless they pay up in 72 hours he'll seize the General Lee as collateral. Bo and Luke have come up with the idea of entering the annual Hazzard County Cross Country Road Race – First prize $5,000, which starts tomorrow. Normally the Duke boys would have a good chance of winning but with the entire Hazzard County Police Force and Boss Hogg revving up to stop them, now they're not so sure.

Every single 'ELITE' product carries the unique 'ELITE' Holographic sticker. Make sure your copy does, it's your guarantee of quality

Mail Order: Just send a cheque or P.O. payable to 'ELITE' or quote your visa card number.

elite

Elite Systems Ltd., 55 Bradford Street, Walsall, England WS1 3QD Telephone (0922) 6'1215. Telex 335622 SPETEL G Attention: Elite

The ZX Spectrum Expansion System. Only £99·95

Sinclair's complete alternative to floppy discs...

The ZX Spectrum Expansion System contains:

- One ZX Microdrive
- One ZX Interface 1
- One wallet containing four programs on Microdrive cartridge
- Microdrive demonstration cartridge
- One blank Microdrive cartridge
- Full documentation
- Connecting lead for Microdrive/Interface 1
- ZX Net Lead

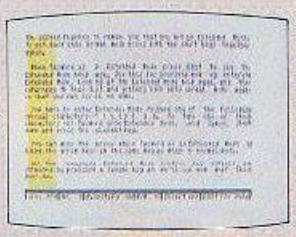
The new ZX Spectrum +

Fully compatible with all Spectrum software and peripherals, including this Expansion System

Tasword Two word processor

Turns your ZX Spectrum into a high-quality word processor!

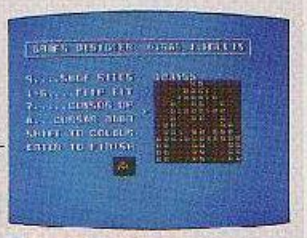
Tasword Two has all the essential features of professional word processing packages – move and copy, insert, margin settings, 'help' pages, find and replace, and much more.
Written by Tasman Software Ltd.
Usual price (RRP): £13.90.



Games Designer

Now, all you need to create original games are original ideas – and Games Designer! It has eight, very different pre-programmed games for you to play as they are – or modify out of all recognition!

There's never before been an easier, more enjoyable, way into games design.
Written by Quicksilva Ltd.
Usual price (RRP): £14.95.



Masterfile filing system

Address lists ... personal files ... stock inventories ... stamp or album collections ... club records ... recipes ... if you can file it, you can Masterfile it!

Masterfile is a menu-driven filing and retrieval system of immense power. Display formats are user-defined, so the range of applications is enormous.
Written by Campbell Systems Ltd.
Usual price (RRP): £16.95.

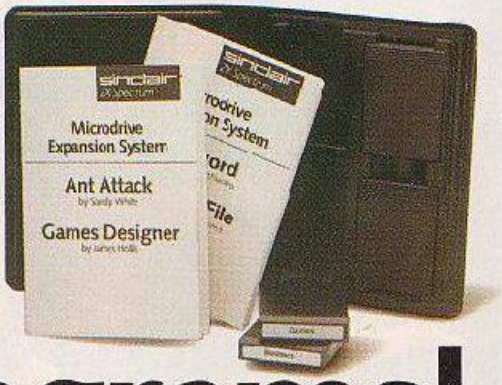
Ant Attack

The all-time classic 3D strategy game. Ant Attack combines stunning Escher-like graphics with fast-moving action and a real tactical challenge.

Your task is to enter the walled city, seek out your captured partner, and escape. At all times you can choose from four angles of view. But beware: the city is patrolled by giant ants ...
Written by Quicksilva Ltd. Usual price (RRP): £6.95.

All programs run on a 48K Spectrum or Spectrum +. Recommended retail prices are for each program on cassette.

...includes this great set of Microdrive programs!



The unique ZX Microdrive system sets the Spectrum apart from all other home computers.

It gives you all the advantages of floppy disc drives – at a fraction of the cost. And tests show the Microdrives are faster than some disc drives.

Now, the complete Microdrive system comes in one package – together with four of the best-ever Spectrum programs, on Microdrive cartridges.

This software alone would normally cost you over £50. Yet the Sinclair price for the complete ZX Spectrum Expansion Pack is just £99.95!

You'll find full details of its contents in the panel opposite.

ZX Microdrives – another Sinclair first!

The ZX Microdrive is a revolutionary fast access / mass storage device. And it's the only truly affordable alternative to disc drives ...

- Loads or saves up to 85K of program or data from Microdrive cartridges.
- Just 3.5 seconds to access a typical file.
- Only 9 seconds to load a typical 48K program.

The ZX Microdrive cartridge – a unique storage medium.

Smaller than a matchbox, the ZX Microdrive cartridge packs in a massive amount of data and programs.

Each Microdrive cartridge holds at least 85K bytes of data or programs (that's 30 pages of A4 text). And you can store up to 50 different data files per cartridge, identified by titles of your choice.

Every cartridge comes in its own protective case. Simply remove the cartridge, slot it into the Microdrive, and it's ready to use.

ZX Interface 1 – adds powerful new capabilities to your Spectrum.

ZX Interface 1 connects to the back of your Spectrum and controls up to 8 Microdrives. (Additional Microdrives are available for £49.95 each.)

It also gives you:

- An RS 232 interface – to link your Spectrum with full-size printers, other computers using RS 232 (the industry standard interface) and provide data transmission over telephone lines, via modems.
- ZX Net – lets you set up a local area network of up to 64 Spectrums, for high-speed data communications between you and Spectrum-owning friends.

At your local Sinclair stockist – today!

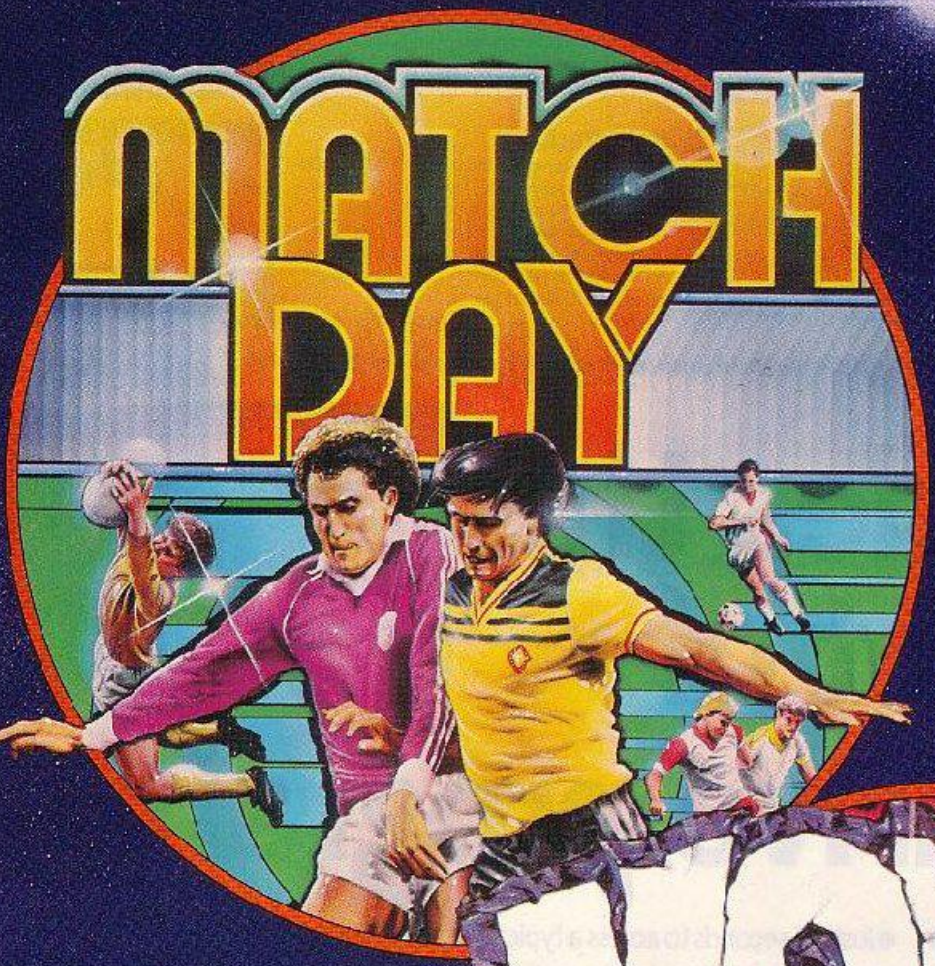
The ZX Spectrum Expansion System adds an exciting new dimension to Spectrum and Spectrum + computing. At £99.95 it's superb value too.

To find out more, call in at your local Sinclair stockist now!

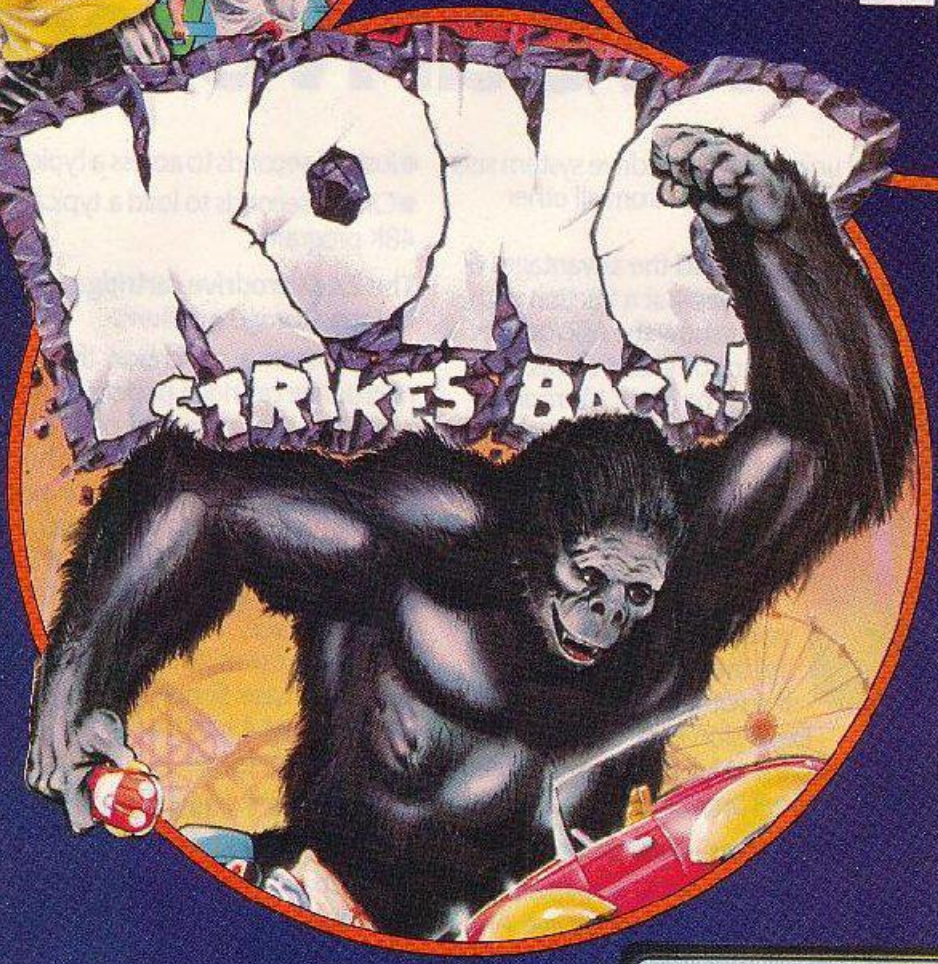
Sinclair Research Ltd,
Camberley (0276) 685311.

sinclair, ZX, ZX Spectrum, ZX Microdrive, ZX Net and ZX Interface are Trade Marks of Sinclair Research Ltd.

sinclair



Don't miss a red-hot wi OCE WINTER →



MATCH DAY
SPECTRUM 48k
7·95

—★—

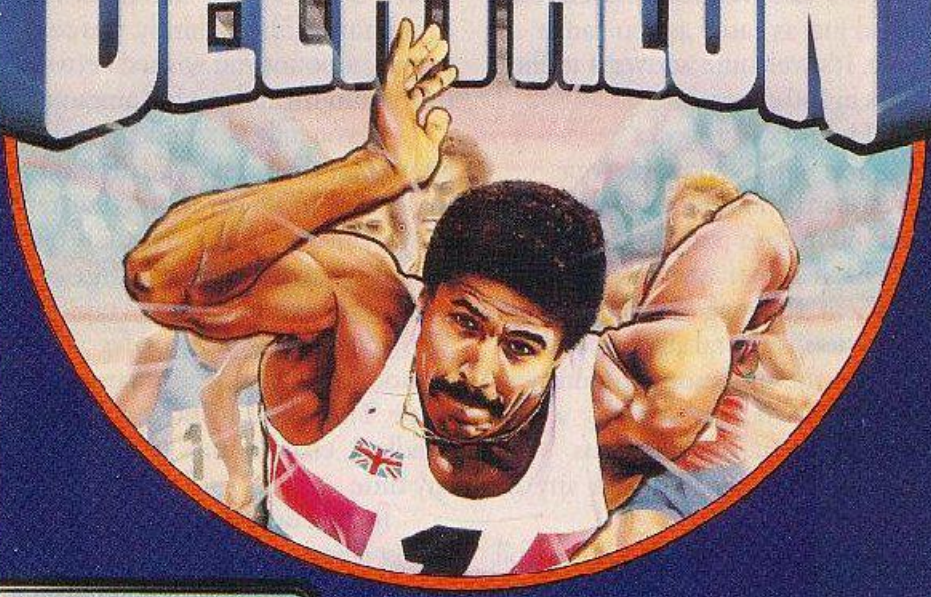
KONG STRIKES BACK
SPECTRUM 48k
6·90
COMMODORE 64
7·90

OCE

Ocean Software
Ocean House · 6 Central Street · Manchester · M2 5NS · Telephone 061 832 6633

t you
all the
t action
ith
AN'S
GAMES

DALEY THOMPSON'S
DECATHLON

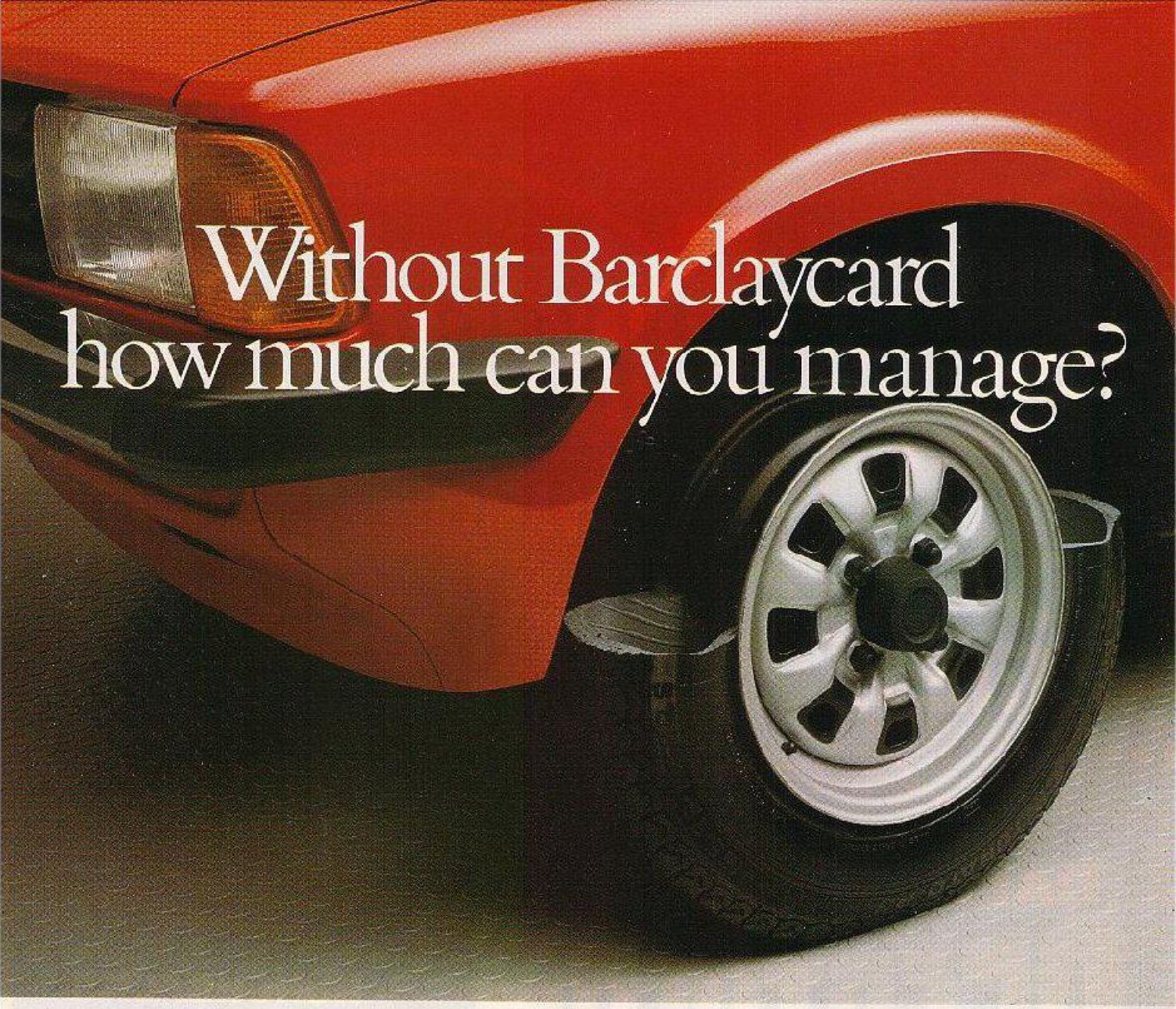


HUNCHBACK II
SPECTRUM 48k
6-90
COMMODORE 64
7-90

DALEY THOMPSON'S
DECATHLON
SPECTRUM 48k
6-90
COMMODORE 64
7-90

ean

Ocean Software is available from selected branches of:
WOOLWORTH, WHSMITH, Boots, John Menzies, LASKYS, Rumbelows, COMET,
Spectrum Shops and all good software dealers. Trade enquiries welcome.



Have you ever needed new tyres when you were flat broke?

Or a new battery when your spending power was exhausted?

It's a problem when you haven't got a Barclaycard.

Suppose, for example, you suddenly have to spend £100 to get your car through its MOT at a time when your bank account is scarcely in the black.

With a Barclaycard you could get your car on the road straight away, sensibly deferring payment to fit in with your income. It's nothing more than intelligent budgeting.

Of course, a Barclaycard's influence goes beyond coping with car expenses and dealing with the unexpected.

It can be used wherever you see the Barclaycard-Visa sign, to pay for countless goods and services.

You can even use a Barclaycard abroad just as easily as you can at home. It's welcome at over 4 million places in 160 countries.

Here's how it works.

You simply present your Barclaycard and sign a voucher each time you make a purchase.

Each month you'll receive a statement showing details of every transaction, the total amount outstanding, the minimum amount you must repay and the date by which your repayment must reach us.

And you can repay in any of three ways.

You could choose to settle in full within 25 days of the statement date and no interest will be payable at all.

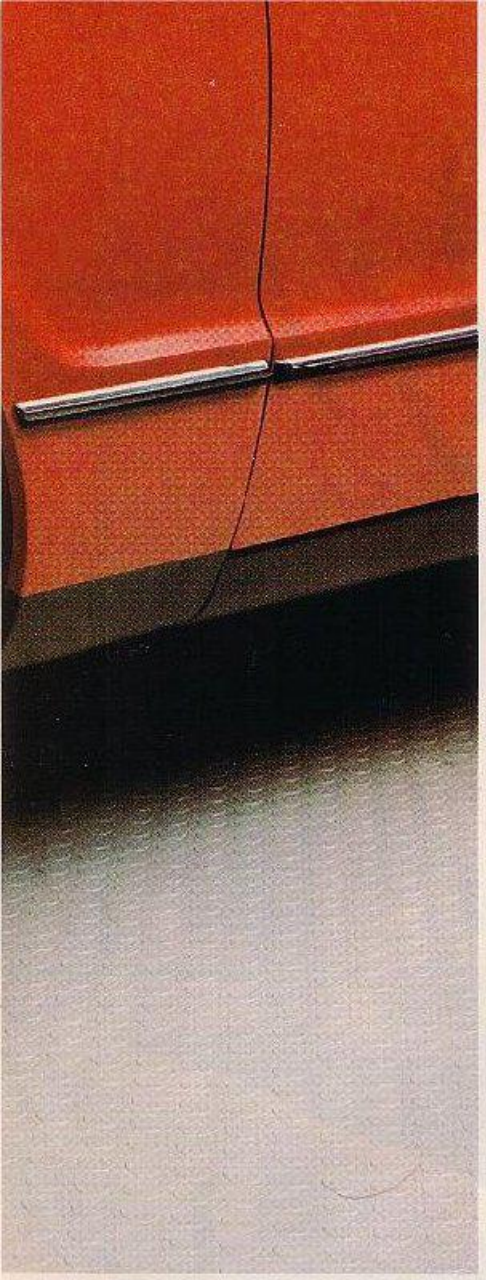
(Which means you could have had up to 7 weeks free credit from the date you made your purchase.)

Or you could pay just the minimum which is 5% of your statement total (minimum £5). Or, thirdly, you could pay any amount you wished between the minimum and the full amount.

If you take extended credit, interest is calculated on a daily basis at the rate of 1.75% per month (current at 1st January 1985). This is equivalent to an annual rate of charge of 23.1% for purchases and, typically, 23.6% for Cash Advances, for which an additional handling charge is made. The monthly interest rate and handling charge may be varied at any time.

In practice, the rate would almost certainly be less.

Say you used your Barclaycard for your £100 MOT repairs two weeks before your statement date and paid off the cost in four equal amounts, each one being received by us 15 days after each statement date.



You would have paid total interest charges of about £3.25 which works out at 16.9% per annum.

If you'd like a Barclaycard and you're over 18, fill in the application. There's no joining fee or annual subscription.

Once you've used your Barclaycard you'll wonder how you ever managed without one.

You don't have to bank at Barclays to have a Barclaycard.

Post your completed application to: N.H. 2000, Barclaycard, Department SJ56, FREEPOST, Northampton NN1 1YG. No stamp needed.

BARCLAYCARD VISA Application

PLEASE COMPLETE IN BLOCK CAPITALS AND TICK WHERE APPROPRIATE. DO NOT USE SHADED AREAS

1. Your name and address. Mr ☐ Mrs ☐ Miss ☐ Ms ☐ Other title _____

First Names

Surname

House Name

Number/Street Name

Village/District

Town/City

County

Postcode

Country

2. Your personal details and telephone number.

Date of Birth (Day Month Year) _____ Are you Single ☐ Married ☐ No. of dependant children _____

Home Telephone No. (including STD code) _____

Business Telephone No. (including STD code) _____

3. Your employment

Employer

Business Address

Present position

Years with present employer _____ Annual Income £

Self employed. No ☐ Yes ☐ If yes, how long _____ years

Occupation of Spouse

First Names of Spouse

4. Your home.

Years at this Address _____ Are you Owner ☐ Tenant Furnished ☐ Tenant Unfurnished ☐ With Parents ☐

If house is mortgaged, give name of Lender

If at present address less than three years give former address

for _____ years

5. Your bank.

Bank Sorting Code

Branch Address (in full)

Type of Account Cheque ☐ (held for _____ years) Deposit ☐ Loan ☐

6. Other cards held.

Access ☐ American Express ☐ Diners Club ☐ Cheque Guarantee ☐

Other Visa cards (Names)

Other Store cards (Names)

Other credit cards (Names)

7. Authorised User

If you wish us to issue a second card on your account for use by another person (eg your spouse) ask that person to complete this section.

Full Name of Authorised User Mr ☐ Mrs ☐ Miss ☐ Ms ☐

Please issue a Barclaycard to me. I accept and agree to be bound by the Barclaycard Conditions of Use (as set out below and as amended from time to time).

Signature of Authorised User

Please issue a Barclaycard to me. I confirm that the information given is true and complete and authorise you to make any enquiries you may deem necessary in connection with this application. I accept and agree to be bound by the Barclaycard Conditions of Use (as set out below and as amended from time to time. I authorise you to issue an additional Barclaycard to the person named as an authorised user of my Barclaycard Account.*
(*Delete this sentence if not required.)

Applicant's Signature. (Please sign in the box below) Date _____

FS		PC		OR		AS			LEO CODE		CC	3	6	9	CL						SC						PB			
STF		DN		MG		BD		AC		EXP					SH	A	B	F	S	RCS	Receiver's Signature									
CALL BACK NO								JP NO							VLU RETURN NO												OP NO			DATE	

BARCLAYS BANK PLC Registered in London, England – Reg. No. 1026167. Reg. Office: 54 Lombard Street, London EC3

Post your completed application to: N.H. 2000 Barclaycard, Department SJ56, FREEPOST, Northampton NN1 1YG. No stamp needed.

Barclaycard Conditions of Use

The use of the BARCLAYCARD is governed at all times by the Barclaycard Conditions of Use.

1. In these Conditions **"the Bank"** means Barclays Bank PLC and its successors and assigns, **"card"** means the BARCLAYCARD currently issued to a cardholder, **"cardholder"** means the person to whom or for whose use a card is issued by the Bank, **"card transaction"** means the purchase of goods or the obtaining of services or cash advances against the use of the card in conjunction where appropriate, with the related personal identification number ("PIN") issued to the cardholder, or otherwise authorised by the cardholder for debit to the card account, and **"principal cardholder"** means a cardholder in whose name a card account is maintained.

2. The card must be signed by the cardholder and may only be used (i) by that cardholder, (ii) subject to the terms of the Barclaycard Conditions of Use which are current at the time of use, (iii) within the credit limit from time to time notified to the principal cardholder by the Bank, and (iv) to obtain the facilities from time to time made available by the Bank in respect of the card.

3. The Bank will debit the card account with the amount of all card transactions effected by the cardholder. The principal cardholder will remain liable to pay to the Bank all amounts so debited whether or not a sale or cash advance voucher is signed by a cardholder.

4. The Bank will normally send a monthly statement to the principal cardholder who will pay not less than the minimum payment shown in the statement to be due to the Bank within 25 days of the date of the statement at the address notified by the Bank.

5. (a) (i) Interest will be charged on a daily basis at the rate of 1.75% per month on the balance which is outstanding on the monthly statement date until any repayments are credited to the card account and thereafter on the reduced balance until the next statement date when the interest for the preceding month will be debited to the card account.
(ii) If, however, the whole of the balance which is outstanding on the monthly statement date is repaid by the close of business on the 25th day following that date no interest will be charged on that balance.
(b) A handling charge of 1.0% on the amount of any cash advance will be debited to the card account.

6. The whole outstanding balance on a card account will become immediately due and payable in full on the bankruptcy of the principal cardholder or, (subject to any limitations imposed by statute) on the death of the principal cardholder or, at the Bank's discretion, if there is any breach of these conditions by a cardholder.

7. The card remains the property of the Bank at all times and will be returned by the cardholder or any other person acting for the Bank on the request of the Bank. The principal cardholder may at any time without notice terminate the agreement as to the use of the card (and without affecting his or her liability in respect of any card transaction prior to termination) by surrendering his or her card to the Bank. The Bank may cancel the card at any time without notice, or refuse to reissue, renew or replace any card. Unless and until such termination occurs the Bank will reissue cards from time to time for use in accordance with the agreement.

8. The cardholder will exercise all possible care to ensure the safety of the card and to prevent the disclosure of the related PIN to any unauthorised person. Any record of the PIN must be kept entirely separate from the card. If the card is lost or stolen or if the PIN is disclosed to any unauthorised person the cardholder must immediately notify the Barclaycard Centre Northampton NN1 1SU (telephone Northampton (0604) 21188) or any branch of the Barclays Group of Banks provided that if this notification is given orally it must be confirmed in writing within 7 days. Until the Bank receives notification of the loss or theft of the card and/or disclosure of the PIN the principal cardholder will be liable in respect of any unauthorised card transaction, but provided he or she has acted in good faith the principal cardholder's liability shall not exceed £25. After the Bank has been properly notified of any such loss or theft or disclosure of the PIN the principal cardholder's liability for subsequent card transactions will cease. The cardholder will give the Bank all the information in his or her possession as to the circumstances of loss of the card or disclosure of the PIN, and take all reasonable steps to assist the Bank to recover the missing card.

9. If a supplier issues a refund voucher in respect of a card transaction the Bank will credit to the card account the amount shown to be due when it receives the refund voucher from the supplier. Unless a refund voucher is issued and sent to the Bank then (subject to any rights vested in the principal cardholder by statute) the account will be payable in full and no claim by a cardholder against the supplier may be the subject of set off or counter claim against the Bank.

10. The Bank shall not be liable in any way if the card is not honoured by a supplier.

11. Where a cardholder uses the card to guarantee payment of any cheque to a third party:-
(a) The cardholder will limit such use to his or her own personal cheques taken from a Designated Bank cheque book issued by a Branch in the United Kingdom including the Channel Islands and the Isle of Man;
(b) the cardholder will sign the cheque in the presence of the payee;
(c) the cardholder will ensure that the payee writes the card number on the reverse of the cheque;
(d) the cardholder will limit such use to a cheque for an amount not exceeding £50 and will not issue more than one such guaranteed cheque in respect of any one transaction;
(e) the cardholder will not issue a cheque against the guarantee in excess of the funds available on his or her current account except with the prior consent of the relevant Designated Bank;
(f) the cardholder will not for any reason countermand payment of any cheque so guaranteed;
(g) the relevant Designated Bank may debit any such cheque to the cardholder's current account without reference to the cardholder and even although the cheque may bear technical irregularities; and
(h) the cardholder will not use this facility outside the United Kingdom (including the Channel Islands and the Isle of Man).

As used in this Condition 'Designated Bank' means Barclays Bank PLC, Barclays Bank International Limited or Yorkshire Bank PLC.

12. The Bank may issue an additional card and the related PIN for use by any person nominated by the principal cardholder as an authorised user on his or her card account. The principal cardholder shall be liable for and the Conditions of Use shall apply to the use of such authorised user's card but in addition to its other powers the Bank may cancel any authorised user's card at any time upon the request in writing of the principal cardholder and the return of such card to the Bank or upon the surrender of such card to the Bank by the authorised user.

13. The Bank may amend these Conditions at any time. Subject to the applicable requirements of statute for giving notice of the variation, publication of the variation by such means as the Bank may select shall constitute effective notice to each cardholder.

A prophecy is about to be fulfilled. The Dead will rise again to eat the flesh of the living...

Zombie Zombie

From the authors of ANT ATTACK, Sandy White and Angela.

DJR

Softsolid 3D* from SPACEMAN
*Patent pending

48K Spectrum £6.95

All titles available from

QUICKSILVA

Quicksilva Mail Order, P.O. Box 6, Wimborne, Dorset BA21 7PY.
Telephone (0202) 891744.

WARNING: These programs are sold according to QUICKSILVA Ltd's terms of trade and conditions of sale, copies of which are available on request.

WHSMITH Boots WOOLWORTH John Menzies and leading multiple retailers and specialist computer stores.

QL NEWS

News from the world of Sinclair QL computing.

One year old... and look how we've grown!

When we launched the QL last year, we knew we were starting a revolution.

For the first time, the serious computer hobbyist could afford the same power and performance as the professional computer user.

A year later, and the QL is more than a unique computer, it's the heart of a unique system.

And the next 12 months promise even more for QL owners... new software options, extra storage devices, printers, monitors...

Read on, and see how far we've come, and how much further we're going!

Nº1

NIGEL SEARLE

Now it's the quantum leap for QL software and peripherals

Without doubt the QL was the computer innovation of 1984. Launched to outstanding reviews, it soon gathered thousands of happy owners, and recognition from people like ICL, who have incorporated QL technology and its Microdrives into the new One Per Desk.

The quickest glance at the QL's specification shows what the fuss was all about...128K RAM, 32-bit processor architecture, 200K built-in mass storage, bundled software. They're features that would normally cost you three or four times as much!

But that's only half the story, because the QL is now the heart of a computer system, with a growing library of software...

As you'll see from these pages, 1985 is the year of the quantum leap for software and peripherals. Already there are no less than five QL languages together with special programs for software developers, a world-beating chess game... and much more on the way!

On the hardware side, there's a special QL monitor to make the most of that high-resolution 512 x 256 pixel display. There are memory expansion boards, Winchester disk drives, printers, and low-cost Microdrive cartridges.

In fact, there's so much going on, we'll be running these regular Newsletters just to keep you in touch!

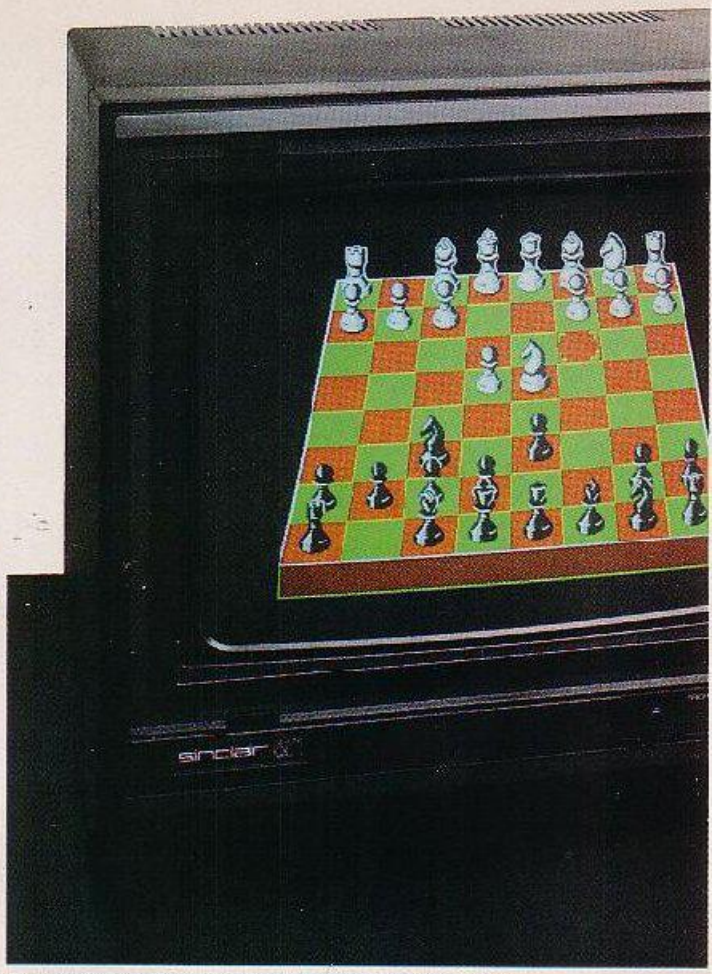
If you already own a QL, the next few pages will give you a taste of the exciting year ahead.

And if you don't . . . take a look at what you're missing. It should be all the persuasion you need!

Now read on...the quantum leap into serious computing starts here.

Nigel Searle

Nigel Searle, Managing Director, Sinclair Research Limited.



From sophisticated business packages to superb animated games... QL software makes the most of the computer's extraordinary specification.

New QL Software

Utilities, languages, games and business packages...with more on the way!

Two things are now certain about QL software. First, there's going to be plenty of it. And second, it's going to set completely new standards for microcomputers...

At the moment, there are well over 100 software programs in development. And the first software releases, shown here, demonstrate how exceptional the best QL software will be.

The QL already has five languages, superb programs for software developers, a top quality accounting package and in Q-Chess it has its first game.

QLUB: 10,000 members and growing!

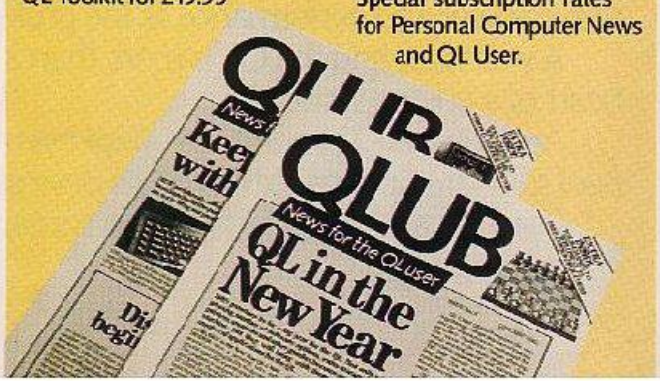
QLUB is the special Users Bureau for Sinclair QL owners. There are now well over 10,000 QLUB members, and membership is growing all the time.

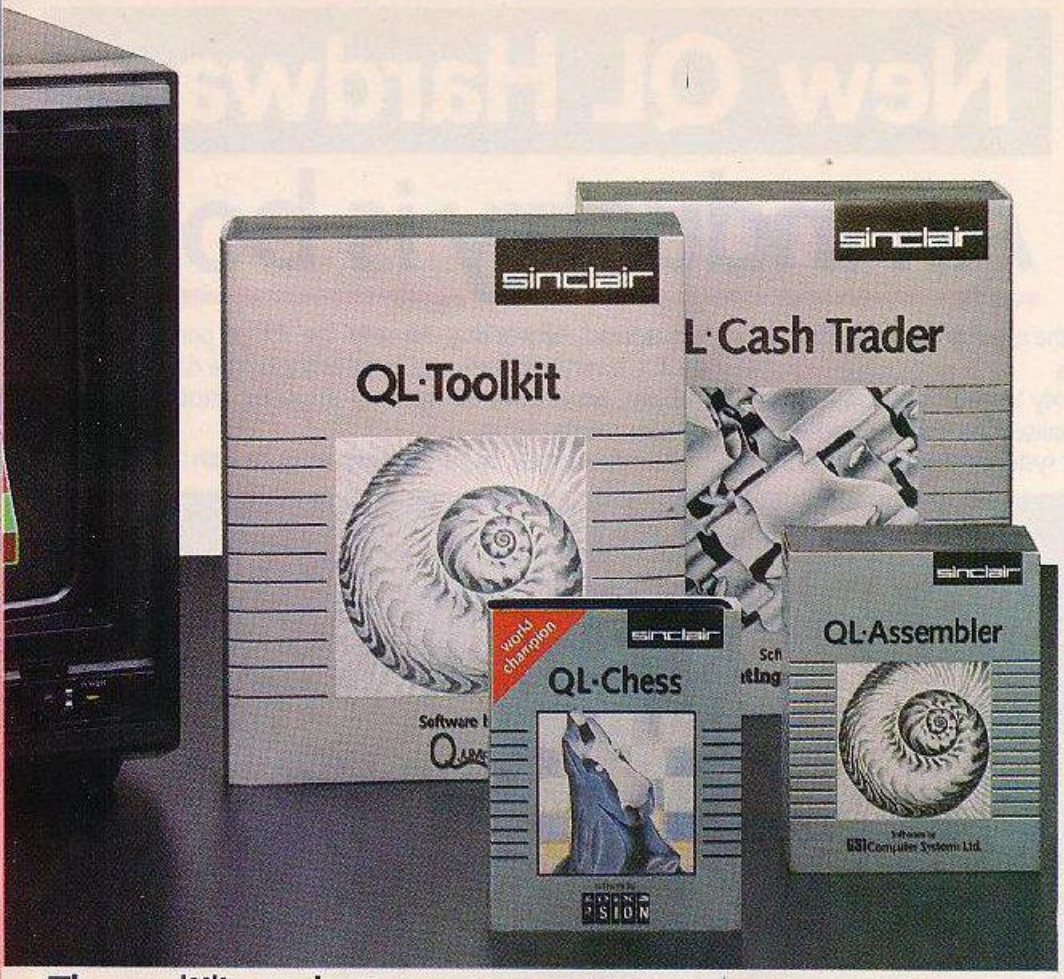
For their annual subscription of £35, QLUB members are enjoying a whole range of information and advisory services, exclusive offers and special discounts.

One of the most important QLUB benefits is the special news magazine, appearing six times a year. The magazine provides a forum for QL owners to exchange views and keep in touch with all the latest developments.

Each issue is packed with updates on QL hardware and software, tips on applying the four QL Programs, and news of how other people are using the QL. QLUB members also receive a range of special discounts, with savings of at least 20% on selected software products.

Current special offers include:
QL Chess for £14.95
QL Toolkit for £19.95
QL Assembler for £31.95
QL Cash Trader for £54.95
Special subscription rates for Personal Computer News and QL User.





The multilingual Sinclair QL

BCPL – a forerunner of C, BCPL has been described as a system's programmer's delight. In the words of QL User, this compiler is a 'brilliant compromise between a high-level language and a low-level systems language'. Whilst not for beginners, this is an essential buy for anyone with a good knowledge of systems programming. Complete with manual.
Available from
Metacomco – £59.95.
Tel: 0272 428781.

LISP – already well-known for its artificial intelligence applications, LISP is a powerful and versatile language. This is a sophisticated implementation of LISP, by one of its leading exponents, Dr Arthur Norman. This package features full QL graphics, and a full manual is supplied.
Available from
Metacomco – £59.95.
Tel: 0272 428781.

Pascal – probably the most popular high-level language of all. Pascal is particularly well-suited to structured programming, sophisticated data manipulation and algorithmic problems. Pascal interpreter complete with 87-page manual.
Available from
Computer One – £39.95.
Tel: 0223 862616.

Forth – this 'new generation' language is proving both popular and easy to earn. The program provides a full implementation of the latest Forth 83 standard with graphics and sound extension.
Available from
Computer One – £29.95.
Tel: 0223 862616.

APL – the compact mathematics-based interpreted language designed for scientists and mathematicians.

APL keyword interpreter complete with manual.
Available from
MicroAPL – £99.95.
Tel: 01-622 0395.

Psion trouble-shooting service

All QLUB members can obtain special assistance from Psion on using the QL Quill, Abacus, Archive and Easel programs supplied with the computer. Psion will normally answer any queries within 48 hours.

Programmer's packs

QL Assembler – two programs operating in tandem. The first is a full-screen editor for creating and altering program files. The second, a Motorola-format compatible 68000 assembler which converts source files written in M68000 assembly language into machine code files which can run on the QL.

Both assembler and editor are written in machine code and can be multi-tasked with SuperBASIC, so you can switch between editor, assembler and SuperBASIC instantly.
Written by GST Computer Systems – £39.95.*

QL Toolkit – a programmer's toolkit with over 70 programs and extensions to SuperBASIC. Most are linked to SuperBASIC initially and can then be used from commands or from within a program. Enhancements include printer spooling (print a file while running a SuperBASIC program); improved file access (with full random input/output command); job control (allows management of multi-tasking programs including the ability to display, alter priorities, and delete jobs from the QL); and SuperBASIC screen editor.
Written by Q Jump – £24.95.*

World-beating chess!

QL Chess – fresh from its victory at the World Microcomputer Chess Championship. This program sets a completely new standard for games software.

There's a high resolution display, animated 3-D graphics, and 28 levels of play from novice to champion. Features include an openings book of nearly 4000 moves, HINT and TAKEBACK functions that help you learn from your mistakes, and the option to play a human opponent or the computer.
Written by Psion – £19.95.*

Software at work

QL Touch 'n' Go – a unique approach to learning touch-typing skills. The program is designed to give you mastery of the standard QWERTY keyboard in just 24 hours. With practice, you should soon reach 40 words per minute, with over 95% accuracy.
Written by Harcourt – £24.95.*

QL Cash Trader – a unique computerised book-keeping system for small businesses. The program provides a complete course in the principles of accountancy, and goes on to become an essential aid in the day-to-day running of a business. Complete with comprehensive manual.
Written by Accountancy Software of Torquay – £69.95.*

*This title is available from Sinclair Research on 0276 686100, and selected Sinclair stockists nationwide.

New QL Hardware

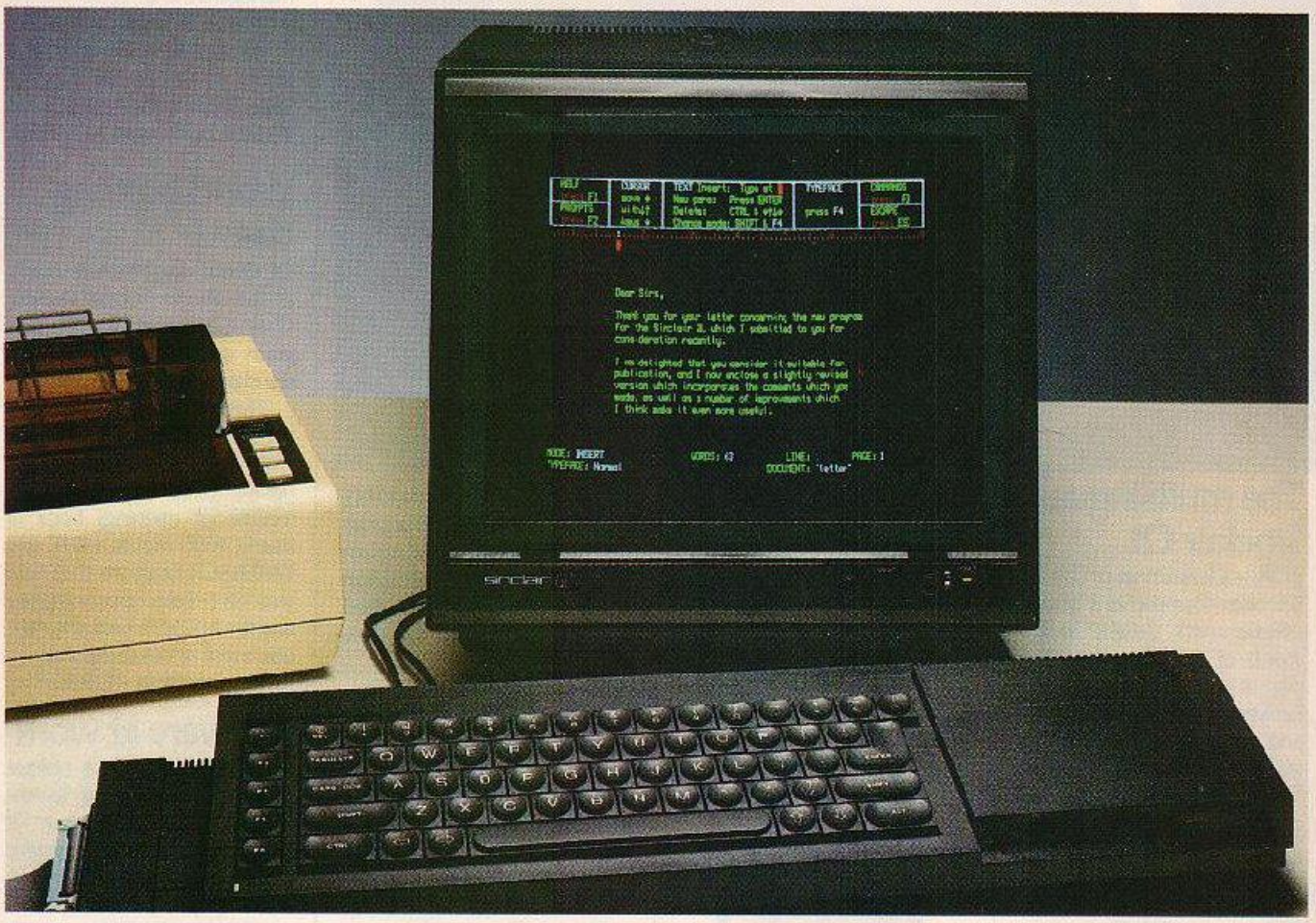
An industry is born

From the moment of its launch, the revolutionary QL attracted massive interest from all quarters.

In one area, the interest quickly turned to action, as high-tech hardware manufacturers realised the immense potential of the QL for vast expansion, for system development and for widespread networking. Already the list of peripherals for the QL is very exciting – and lengthening by the day!

Here, we've covered many of the latest, most important developments.

As more appear, be sure to keep in touch with QL News!



The dedicated Sinclair Vision QL monitor

Once you see the incredible graphics capabilities of the QL you may decide an ordinary TV just can't do them justice.

If that's the case, a high-resolution monitor is needed. (And if you're creating presentation-quality charts, for example, it's quite essential.)

The new Vision QL monitor is specially designed for the computer by Kaga Electronics, with full support from Sinclair Research.

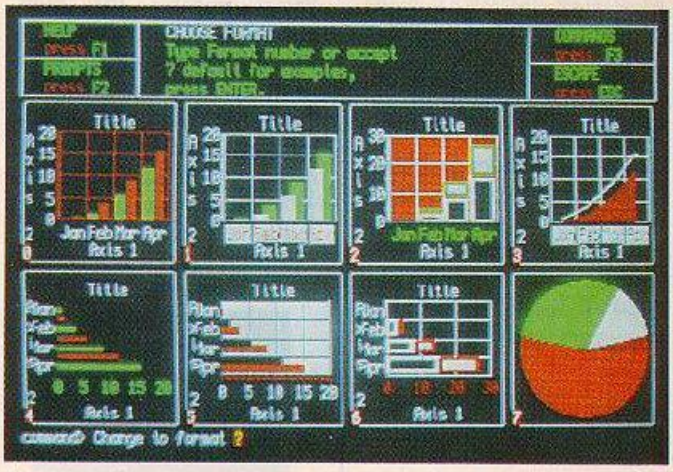
So it exploits the QL's maximum 512 x 256 pixel resolution to the full, with a pin-sharp 85 column display.

It's also specially styled to suit the QL – in looks, and in use. There's a 12" non-glare tube, and etched screen to diffuse reflections.

So the display is bright, sharp, *much* easier to look at . . . and invaluable for those late-night programming sessions!

And like the QL, the Vision monitor is designed with space in mind: it has a compact footprint of just 12½" by 15" – no more than a typical portable typewriter.

It's available from MBS Data Efficiency on 0442 60155 and selected Sinclair stockists.



The QL's superb graphics capabilities – as demonstrated by the Sinclair Vision QL monitor.

Microdrive cartridges. Now only £1.99!

Microdrive cartridges are the QL's own unique storage media. Each stores up to 100K of information, on a cartridge no bigger than a matchbox!

Over 500 000 cartridges are now being used throughout Britain. And QL Microdrives themselves are standard equipment on the new ICL One Per Desk micro.

Now there's more good news for QL enthusiasts: from February 1, the cost of QL Microdrive cartridges are down from £4.95 to £1.99 each!

Sinclair Microdrive cartridges – up to 100K of programs and data on a medium so compact you can pop it into your pocket.

Powerful hard-disk system

For the QL business user, the new Firefly QL Winchester disk will boost the QL's power in one huge leap.

Designed by Quest, it uses CP/M and offers all the benefits of Winchester technology: fast access, reliability, compact size and quiet operation.

With 75 Mb storage, the Quest Firefly is ideal for large databases such as stock or customer lists. And at under £1,200, it represents exceptional value for money.

The Firefly will be available very shortly from Quest on 04215 66488.

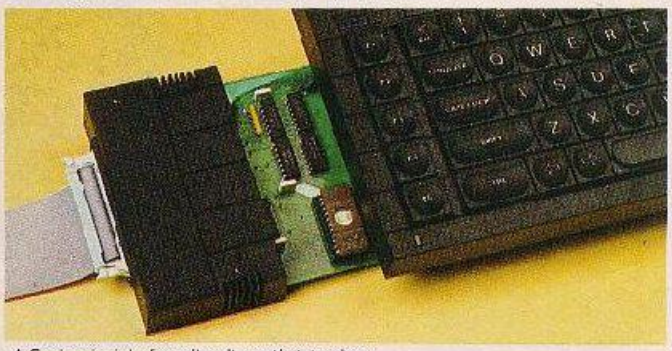
Winchester hard disk drives supplement your QLs built-in mass storage.

Interface options

The QL comes complete with two built-in RS-232C interfaces.

In addition, interfaces for Centronics printers are widely available from manufacturers such as CST, Miracle Systems and Sigma Research . . . with prices from only £35.

And that's just the beginning. For attaching scientific and laboratory instruments to the QL CST even offer an IEEE-488 interface, which can handle up to 16 connected devices simultaneously!



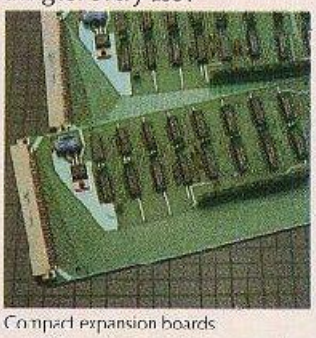
A Centronics interface slips discreetly into place.

Expansion boards for up to 4 times more memory!

Also from Quest, a simple and inexpensive way to expand the QL's RAM: with memory expansion boards.

These compact units connect to the standard QL expansion port, using the QL's internal power source or, for larger boards, an external power source.

The units range from 64K and 128K RAM boards to massively powerful 256K and 512K RAM boards, so there's something for every user.



Compact expansion boards.

Prices start at £117, and the 512K board is a very cost-effective investment at just £537.

With affordable memory like this, the QL is more than a match for any other micro under £2,000!

Where to find the QL.

The Sinclair QL is available at selected branches of Dixons, W H Smith, John Lewis Partnership, Currys, Greens in Debenhams and Ultimate, and larger branches of Boots, John Menzies and specialist computer stores nationwide.

sinclair, QL, QUB, and Qdos, are trademarks of Sinclair Research Ltd. Quill, Easel, Archive and Abacus are trademarks of Psion Ltd. Due to our policy of continual product improvement, Sinclair Research Ltd reserve the right to alter specifications at any time.

The spec behind the spectacle

CPU – Central Processing Unit
Fast, powerful Motorola 68008 chip. A second processor, an Intel 8049, controls the keyboard, generates the sound, and acts as an RS-232C receiver.

RAM
128K. Now expandable to 640K.

ROM
48K.

Operating system
Qdos – revolutionary single-user, multi-tasking, windowing operating system.

Storage
Twin built-in QL Microdrives. Up to 100K storage each – transfer rate, up to 15K per second.

Keyboard
Full moving 65-key QWERTY, five function keys, four cursor keys.

Language
Sinclair structured SuperBASIC.

Application software
QL Quill – word processor
QL Abacus – spreadsheet
QL Easel – graphics
QL Archive – database
All four packages supplied with the QL.

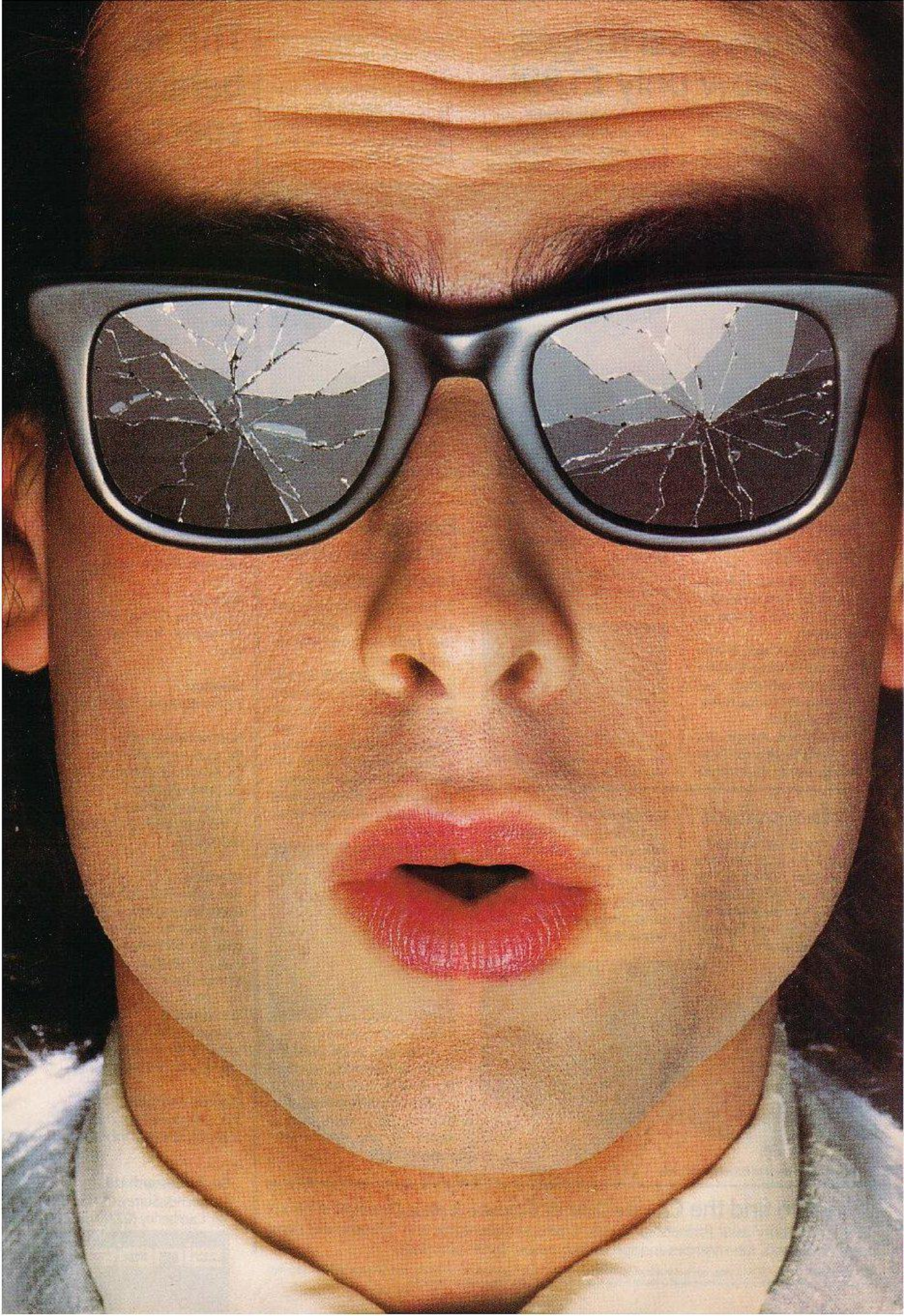
Interfaces
Two serial RS-232C interfaces, Microdrive expansion port (up to 6 may be added), ROM cartridge port, local area network, 2 joystick ports, RGB monitor and TV output.

Text screen
Various modes – up to 85 columns by 25 rows on monitor. On TV, up to 60 columns.

Graphics resolution
512 x 256 pixels (four colour), 256 x 256 pixels (eight colour).

Sinclair Research Ltd
Camberley, Surrey, GU15 3BR.
Tel: Camberley (0276) 686100.

sinclair



You should see what he's just seen.

Micronet 800.

Stretching the mind of your micro far beyond its limits.

Micro evolution continues with this unique communications, information and software system. Set on our mainframes nationwide.

Includes 30,000 pages and access to Prestel™ with its full range of services.

A tremendous Communications section that networks you to thousands of other members across the country. Send and receive electronic messages and graphics at a touch of a button.

And there's the Chatline service, Swapshop and Teleshopping.

Check with daily updates on the very latest computer news.

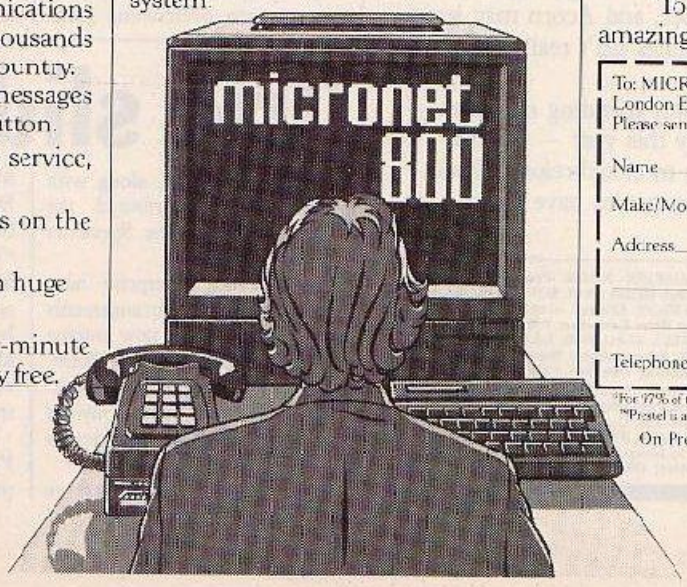
Micronet also has its own huge facts data base.

And a choice of up-to-the-minute software to download absolutely free.

For only £13 a quarter and just a local* telephone call whenever you want to connect up (that's only 22p per half hour at cheap rates) you could be part of Micronet.

The only accessory you need is a Modem.

A small price to pay to join the other visionaries on this exciting new system.



Fill in the coupon for more details and send to Micronet 800, Durrant House, 8 Herbal Hill, London EC1R 5EJ.

But be warned, Micronet 800's features are almost limitless and constantly updating. So maybe you'd be better to call in at Laskys, John Lewis, main Boots or your local Micronet 800 Action Station.

To feast your eyes on all the amazing things it can do.

To: MICRONET 800, Durrant House, 8 Herbal Hill, London EC1R 5EJ. Telephone 01-278 3143.
Please send me the full facts about Micronet 800.

Name _____

Make/Model of Micro _____

Address _____

Telephone _____ YC3

*For 97% of telephone users.
™Prestel is a trademark of British Telecommunications.

On Prestel

DOUBTS FROM ACORNS GROW

THE FIRST SIGNS for Acorn's employees that Cambridge wasn't all growth and glittering prizes was when they opened the *Daily Mail* to find an exclusive interview with their boss Chris Curry. There, among the revelations about Curry's steamy sex life, fast cars and million-pound mansion was the first mention of redundancies.

Meanwhile, next door but one to Acorn's customer service department, the familiar sound of gently bursting bubbles could be heard as Oric sank beneath the waves.

Still within the city limits a surprisingly ruffled Sir Clive Sinclair launched an unprovoked attack on Atari's QL-bashing ST computers — claiming they were a figment of Jack Tramiel's imagination. Wishful thinking perhaps, given the QL's disappointing sales of 50,000 in a year which celebrated the production of the five-millionth Sinclair-designed micro.

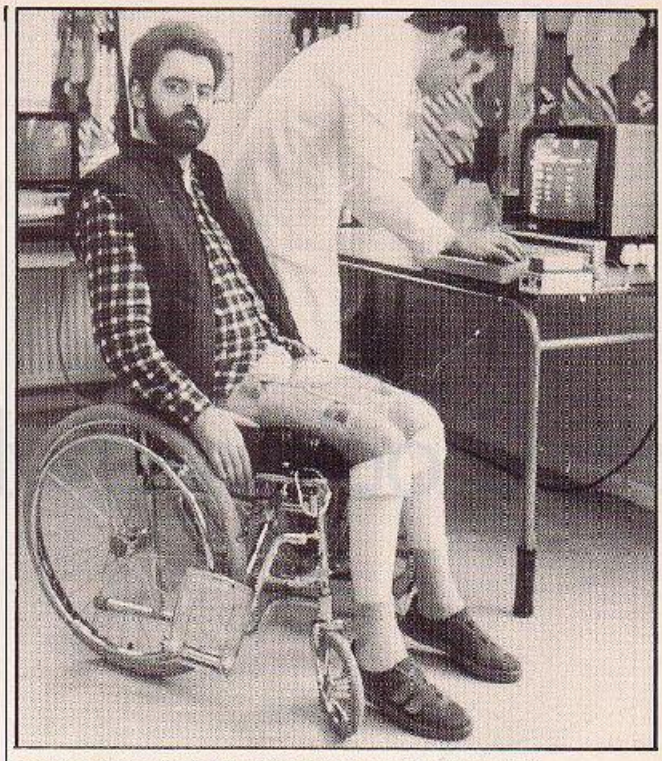
Could the curtains be closing on the stars of the great British micro industry? So far 1985 has been a bad year for everybody, but don't expect to see Sir Clive trading in his Porsche for a C-5 quite yet.

Sinclair dominates the U.K. market as much today as he did in 1981. But gone are the innovations. Even the 1982 model of Clive Sinclair wouldn't have been content with reboxing an existing machine. However good the Spectrum and despite his commitment to the 68000, Sinclair now runs the risk of becoming a one-computer company. Yet whereas that could be a problem in the making, Acorn has an immediate and deep crisis on its hands.

Its shares had fallen from a high of 193p last year to 23p before they were temporarily suspended on the Stock Exchange at 28p. Job cuts and a major reorganisation are part of paying the price for a poor Christmas and the disastrous foray into the U.S. market. The abortive American project may have cost the company as much as £12million and its recent £20,000 sales to Russia won't make much of a dent in that. Apart from that, the BBC Micro isn't getting any younger or appreciably cheaper, and Acorn may learn that producing business machines isn't really as easy as ABC.

But despite the pall of gloom, spending on home computers should rise sharply this year — up to a record £590million according to stockbrokers Wood Mackenzie. All the British companies have to do is go out and grab their share.

Editor: TONY WOLPE; **Assistant Editor:** MERION JONES; **Production Editor:** IAN VALLELY; **Software Editor:** SIMON BEESLEY; **Sub Editor:** PAUL BOND **Editorial Assistant:** LEE PADDON; **Editorial Secretary:** LYNN DAWSON. Editorial: 01-661 3144. **Advertisement Manager:** NICK RATNIEKS 01-661 3127 **Senior Sales Executive:** JULIAN BIDLAKE 01-661 8458; **Advertisement Executives:** NIGEL BORRELL 01-661 3660; KAY HILBIN 01-661 8484; **Northern Office:** GEOFF PARKER 061 872 8861; **Advertisement Secretary:** MAXINE GILL; **Classified:** SUSAN PLATTS 01-661 3036; **Publishing Director:** CHRIS HIPWELL; **Group Advertisement Manager:** SHOBHAN GAJJAR. Your Computer, Room L221, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. © Business Press International Ltd 1985. Printed in Great Britain for the proprietors Business Press International Ltd Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500, Telexgrams: 892084 BIPRESG. ISSN 0263-0085 Printed by Riverside Press Ltd. Whitstable, Kent, and typeset by Instep Ltd, London EC1. Subscriptions: U.K. £12.50 for 12 issues. **Subscriptions inquiries:** (0444) 459188. ABC 154,334 January-June 1984.



Creasey controlling Douglas Herd's muscle movement.

PLEA FOR DISABLED

DR GRAHAM CREASEY'S plea for government funding to "give the disabled as much access to micros as people in schools" is being ignored by the Department of Health and Social Security.

"A micro can be at least as useful as a wheelchair", says Creasey who uses BBC Micros in his spinal unit at Edinburgh's Edenhall Hospital to improve his patients' manual dexterity while entertaining them.

He is also using micros for research into overcoming paralysis by controlling a series of electrical shocks to stimulate the muscles.

The Department of Trade and Industry already makes £2million a year available from its information technology budget for schemes including functional electronic stimulation and remote work units for the disabled.

But the DHSS says it has "no plans" to extend this sort of scheme to make micros available to all the disabled who might benefit.

Oric slides

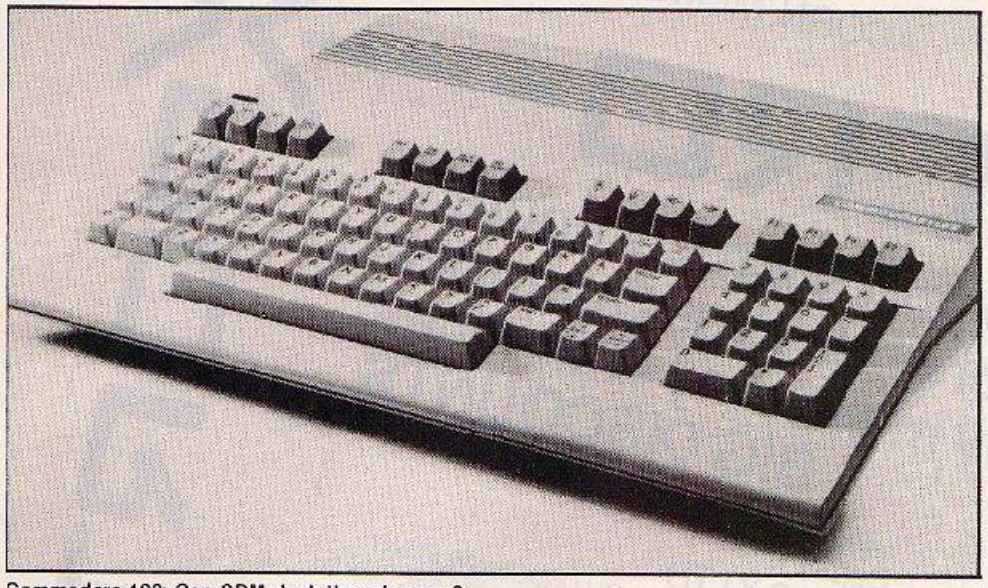
ORIC HAS CRASHED, along with Prism which distributed the Atmos as well as the Spectrum and the Enterprise.

Sinclair and Enterprise have made alternative arrangements and the receivers are now looking for buyers for Oric and Prism. Barry Moncaster of Oric is suggesting a management buy-out and a multinational company is also believed to be interested.

Oric's normally talkative Marketing Consultant Bruce Everiss, who last year jumped before Imagine fell, will only say: "If I had a crystal ball I wouldn't be sitting here now". But he admits that French Atmos sales have collapsed in the last couple of months — "the Amstrad is the cult machine in France at the moment".

In Britain Oric has blamed Prism for failing to distribute properly.

PRICE FIGHTS
Sinclair and Acorn war



Commodore 128: Can CBM duck the price war?

MASSIVE PRICE CUTS, £50 off the Spectrum Plus and £70 off the Electron, have left the two old rivals squaring up to each other at the £130 mark. The first casualty of the war has been the "dead flesh" keyboard of the old Spectrum which has been buried without ceremony — only the click keyboard Plus will continue.

A Plus upgrade from Sinclair for an old Spectrum will cost £30 — or £20 for a kit which may put other keyboard makers out of business. Sinclair, who celebrated the manufacture of the five millionth Sinclair designed micro last month, has also taken on Commodore by chopping the price of Microdrive cartridges to £2 and claiming that the Microdrive saves and loads faster than the notoriously slow CBM 1541 disc drive.

But Commodore insists it will not cut prices yet. Nevertheless expect a cheaper 64 to make room for the CBM 128 this summer. This may leave the C-16 and Plus-4 in no-man's land.

TOUCHING BYEBYE TO THE KEYBOARD

Touchtech turns screen into paper.

TOUCHSCREENS are the ultimate in megapriced accessories for the executive who has everything — except the ability to communicate with a micro through its keyboard.

Now Microvitec is introducing the first budget-priced touchscreen, the Touchtech 501, which will allow the idea to be used to teach youngsters and the disabled. The 501 is a frame which fits over the screen of an ordinary 14in. Microvitec monitor.

The frame contains a grid of 12x16 infra red beams and sensors which are interrupted if a finger is placed on the screen. To improve resolution each beam fans out across three receptors which can distinguish it from other beams — this gives up to millimetre resolution in the centre of the screen.

Touchtech comes with a package of programs ranging from noughts and crosses to an artist program which allows you to paint on screen with your finger using a palette of six colours.

Open the box for C4's telly software

TELLY SOFTWARE allows you to download programs straight from your television. All you need is a home made light pen to stick over the pulsating cursor square which will be appearing in the corner of the screen on Channel 4's new show, 4 Computer Buffs, every Monday night.

Mike Thorne of University College, Cardiff has produced a design for a pen which you could make yourself for less than £5. All you need to do is plug it into your computer — Spectrum and BBC programs will be broadcast initially — and attach the light cell end to the screen where it can pick up the binary code flashing through.

Because the speed of data transmission is limited by the scan rate of the television screen it can take five minutes to load each kilobyte of program.

Quickdisc takes on Microdrives

QUICK DISCS for the Spectrum should be available from April for around £100. The Crescent Quickies use a spiral disc like a record which cannot be randomly accessed like the concentric discs which make most disc drives so fast. However according to the Crescent's makers, Servicon Dynamics, it is up to 20 times faster than a Microdrive.

Commodore on Telsoft

NEXT MONTH our Telsoft service kicks off the new Commodore 64 facility with the Space Junk program which starts in this issue.

So far 12,000 calls have been made to the free downloading service since Telsoft opened up with BBC and Spectrum programs from our December issue. Details of transmission times for your machine on (0206) 8068.

SINCLAIR
ORIC, COMMODORE
ACORN, MEMOTECH, ETC

MICRO--->EXPORT

We export Microcomputers
and Peripherals to all Countries
Any make. Any Quantities
BIG DISCOUNTS

send for comprehensive price list to:
Dept S
MICRO-X LTD
765-767 HARROW ROAD, LONDON NW10 5NY
TELEPHONE 01-968 6622 TELEX 915866 MICROX G

Miles Better Software
221 Cannock Road, Chadsmoor, Cannock
Staffs WS11 2DD. Tel: (05435) 3577

U.S. Gold Software

	ZX	CBM or ATARI	
	CASS	CASS	DISC
Beach Head*	6.95	8.95	11.95
Raid on Moscow	6.95	8.95	11.95
Strip Poker	6.95	8.95	11.95
Forbidden Forest*		7.95	11.00
Aztec Challenge*		7.95	11.00
Slinky*		7.95	11.00
Caverns Khafka*		7.95	11.00
Pooyan		8.95	11.95
Bruce Lee*	6.95	8.95	12.95
Dallas Quest*			12.95
Smokie*		8.95	11.95
Flak*		8.95	12.95
Stellar 7		8.95	11.95
Mystic Mansion		7.95	11.00
Solo Flight*	8.95	12.95	12.95
Spitfire Ace*		8.95	11.95
F15-Eagle*	8.95	12.95	12.95
NATO Commander*		8.95	11.95
Indiana Jones		8.95	
Tapper	6.95	8.95	11.95
Congo Bongo	6.95	8.95	11.95
Up n Down	6.95	8.95	11.95
Spy Hunter	6.95	8.95	11.95
Buck Rogers	6.95	8.95	11.95
Knights Desert*		12.95	12.95
Combat Leader*		12.95	12.95
Battle Normandy*		12.95	12.95
Fort Apocalypse*	6.95	8.95	12.95
Drelbs*	6.95	8.95	12.95
Blue Max*	6.95	8.95	12.95
Sentinal		8.95	12.95
Zaxxon*	6.95	8.95	12.95

*Available for the Atari
Please phone for software availability and software lists for the 64 and Atari

ADD £1 for overseas orders. ACCESS/VISA

THE VIKINGS ARE COMING!!!

SWESCOT are proud to announce that we will soon be releasing several top quality programmes on the international market, made by some of Sweden's most proficient programmers.
And best of all.....PRICES FROM £1.99
Du som bor i Skandinavien och söker bra program till din hemdator.

KONTAKTA OS!!!

Vi har det mesta som finns i denna tidning till ***samma*** laga priser som gäller i England. Dessutom far vi in alla nyheter ***samtidigt*** som de släpps i England.

OBS!!! Vid katalogbeställning v.g. medsänd 5:– Sk i frimärken för portot.

SWESCOT
Box 213
121 02 Johanneshov
Sweden
08/39 27 00 — 08/81 18 01

"THE GUY threatened to break my knees last week" jokes Bruce Everiss, well we hope it was a joke, after talking to Fireiron's new backer, scrap dealing millionaire Talbot Smith. Fireiron — home of Imagine refugees like Eugene Evans and Dave Lawson — has been plagued with practical jokes. One week six driving schools turned up to give one-time Lotus driver, now Beetle owner, Eugene his first driving lesson. For some reason frying pan to fire specialist Bruce — who moved from Imagine to Oric — fell under suspicion and was warned off by someone he describes as "Talbot Smith's goons". Mild-mannered Bruce replied by sending him a bunch of daffodils which provoked the call from the breaker's yard.

EYE PATCH firmly in place and parrot on shoulder I ring up a Mr Ramsden of Pye Greave Farm near Barnsley who is offering Commodore 64 software for sale "all copied but excellent" from tape, disc or cartridge. His "brother" answers, Mr Ramsden is not there. I identify myself and say I will be back in touch. "Just you be careful", the "brother" replies, "or I'll be back in touch with you good and proper".

AMSTRAD BOSS Alan Sugar has been stirring rumours of new Amstrads — essentially different versions of the current machine with built-in drives and more memory — but Amstrad is keeping mum about the details. Amsoft's William Poel — the man who offered to eat an Amstrad in Trafalgar Square if the machine was late — says Sugar's guiding principle is "don't stimulate until you can consummate".

I KNOW sales of the QL could be better but does Sinclair have to go to the extreme of giving away hundreds of them to Strathclyde University in order to win the lukewarm tribute that very few have gone wrong?

ACORNSOFT'S David Johnson Davies will be surprised to hear himself described as "a cross between Ivan Lendl and an Egyptian mummy", particularly by someone who is about to launch his Elite on the CBM-64. Allegedly David "is good at tennis, gets as far as the semi-finals and then trips over the bandages". What can this mean?

Elsie Dee

ANGRY ATARI

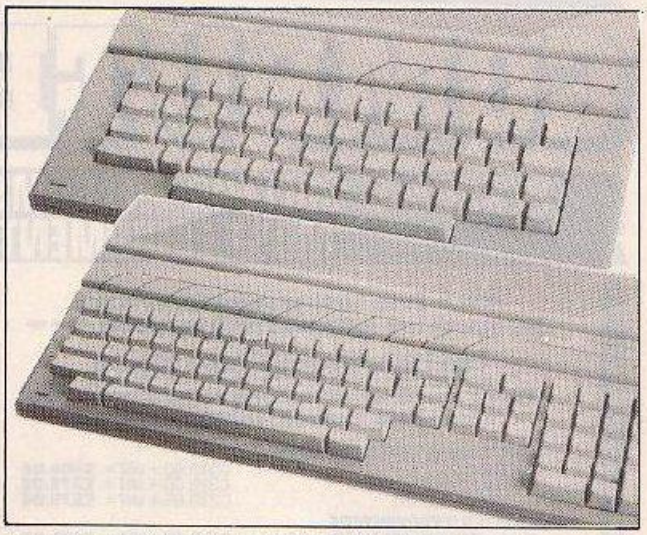
Jack's boys hit back

ATARI IS ACCUSING Sinclair of sour grapes after his attacks on the new ST micros. "Sir Clive tried with the QL and it hasn't succeeded", says Atari's U.K. marketing director Robert Harding.

Sinclair admits that "'84 was a tough year for the QL" but insists that "'85 is going to be the year of the QL" rather than of the rival 68000-based Atari ST range which Sir Clive claims will be late and disappointing.

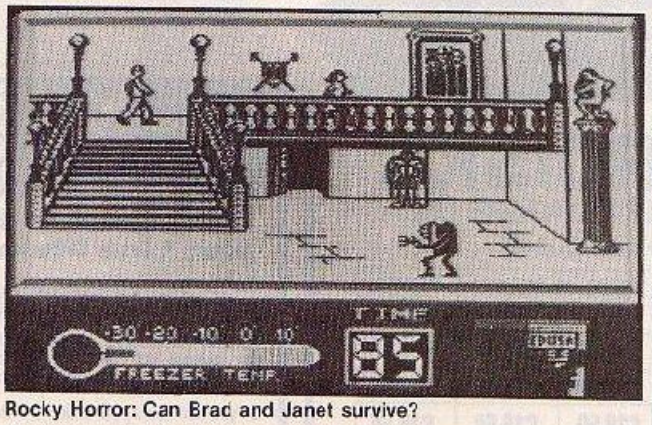
Harding's schedule for this year is to introduce the Infinity package on the 800 XL for around £100 this spring — this includes word processor, spelling checker, database and spreadsheet, launch the 16-bit STs in the summer and the 8-bit £170 128K XE replacement for the XL in the autumn.

The 128K 130ST will cost no more than a QL and the 520 ST with half megabyte Ram, TV monitor, 3.5in. drive, mouse, printer and Infinity less than £1,000. Whose machines will answer the 68000-based question — Jack Tramiel's or Sir Clive's — or will they settle it over 15 rounds in the Baron of Beef.



Tramiel's new Atari ST, and behind, XE micros.

ROCKY HORROR — A SMALL SCREAM



Rocky Horror: Can Brad and Janet survive?

BANNED in South Africa on the grounds that repeated showings would corrupt the nation's youth, and even more mysteriously deleted from Cliff Richard's memory the Rocky Horror Show is about to be unleased onto the small screens of a million Spectrums.

Richard O'Brien's camp, gothic, glam-rock, fantasy horror spoof musical which spun off the stage into films, records, books and parties in the mid 1970's will be a CRL computer game by March.

But writer Richard will not be playing much part in the project since he is "terrified of technology" — he does not use a word processor, nor even a typewriter. "I'd rather work with a pad and a pencil." He's leaving the programming to long-time Horror fan Ian Ellery.

You can be Brad or Janet, clean cut American teenagers as you roam the haunted and decidedly decadent house trying to free your companion who has been turned to stone, encountering such wacky characters as Eddy — the force from the freezer. While the Spectrum does not give full range to songs like *Science Fiction-Double Feature* CRL is already working on a Commodore 64 version with the declared aim of bettering Activision's rendering of Ghostbusters — but then CRL also claims that Rocky Horror is "good wholesome family fun."

Cliff Richard? — O'Brien was watching TV the other day when he heard Cliff talking about Boy George, "No-one would have thought ten years ago that a man dressed up as a girl would be a hit". "Wrong, Cliff" was O'Brien's reaction — in 1975 Rocky Horror's show stopper Tim Curry in his high heels and fishnet stockings was the talk of the town.

Cash & Carry COMPUTERS

TOP SHOWROOM SERVICE

ROCK BOTTOM PRICES

PERSONAL CALLERS WELCOME AT OUR EXTENSIVE SHOWROOMS
MOST EQUIPMENT ON DEMONSTRATION

→→→ Even further price reductions this month are indicated with an arrow →→→

The UK's Best Printer Prices

Only a sample of our massive range of printers shown here – phone for further details

DAISYWHEEL LETTER QUALITY

Juki 6100 (P)	£349.90 + VAT =	**£402.39**
Brother HR15 (P and S)	£329.00 + VAT =	**£378.35**
Daisystep 2000 (P)	£239.95 + VAT =	**£275.94**

PRINTER/TYPEWRITERS

Brother EP22 Dot Matrix (S)	£109.00 + VAT =	**£125.35**
Brother EP44 (S)	£189.00 + VAT =	**£217.35**
Modems available for Easylint and Telecom Gold		
Juki 2200 Daisywheel (P or S)	£245.00 + VAT =	**£281.75**

DOT MATRIX PRINTERS

Brother M1009 (P and S)	£169.00 + VAT =	**£194.35**
Brother HR5 (P or S)	£125.00 + VAT =	**£143.75**
Canon 1080A NLQ (P)	£309.90 + VAT =	**£356.39**
Canon 1156A NLQ (P)	£396.90 + VAT =	**£456.44**
EPSON RX80 (P)	£195.00 + VAT =	**£224.25**
EPSON RX80 F T PLUS (P)	£220.00 + VAT =	**£253.00**
EPSON FX80 (P)	£324.00 + VAT =	**£372.60**
EPSON RX100 F T (P)	£339.96 + VAT =	**£390.95**
EPSON FX100 F T (P)	£430.00 + VAT =	**£494.50**
Kaga Taxan KP810 NLQ (P)	£289.00 + VAT =	**£332.35**
Kaga Taxan KP910 NLQ (P)	£379.00 + VAT =	**£435.85**
→ Seikosha GP500A (P)	£113.00 + VAT =	**£129.95**
→ Seikosha GP700A Colour (P)	£243.43 + VAT =	**£279.95**
Shinwa CTA80 (P)	£199.90 + VAT =	**£229.89**

(P)=Parallel-Centronics (S)=Serial RS232

Smith Corona range of printers Now in Stock – Phone or write for details

INSTANT CREDIT Up to 36 months to pay

All items over £150 available on our easy credit terms. Written details available on request.

12" MONITORS – GREEN SCREEN

Sanyo 2112 Med Res	£65.00 + VAT =	**£74.75**
Sanyo 8112 High Res	£88.00 + VAT =	**£101.20**

14" MONITORS – COLOUR

Commodore 170' Composite/Sound	£173.00 + VAT =	**£198.95**
→ Fidelity CM14 RGB/Comp/Sound	£169.00 + VAT =	**£194.35**
Microvitec 14310 Med Res RGB	£175.00 + VAT =	**£196.95**
Microvitec 1431DZ for ZX Spectrum	£199.00 + VAT =	**£228.85**
Microvitec 1451DS Med Res RGB	£225.00 + VAT =	**£253.35**
Microvitec 1451DQ for Sinclair QL	£234.74 + VAT =	**£269.95**
Microvitec 1441DS High Res RGB	£379.00 + VAT =	**£435.85**
Sanyo 3125 Norm Res RGB	£173.00 + VAT =	**£198.95**
Sanyo 3117 Med Res RGB	£285.00 + VAT =	**£327.75**
Sanyo 3115 High Res RGB	£399.00 + VAT =	**£458.85**

Commodore

→ Plus 4 NEW 64K Computer	£199.95 + VAT =	**£229.96**
→ C16 Starter pack inc. cassette deck	£99.95 + VAT =	**£114.95**
Commodore 64	£165.17 + VAT =	**£189.95**
SX64 Portable inc D. Drive and Col. Monitor	£478.22 + VAT =	**£549.95**
C2N Cassette	£32.61 + VAT =	**£37.50**
1541 Disk Drive	£182.57 + VAT =	**£209.95**
DPS1101 Daisywheel Printer (by Juki)	£305.95 + VAT =	**£356.44**
→ 801 Tractor Printer	£130.39 + VAT =	**£149.95**
802 Friction Tractor Printer	£260.83 + VAT =	**£299.95**
1701 Colour Monitor	£173.00 + VAT =	**£199.00**

Amstrad

CPC464 Green Monitor inc. FREE software	£209.00 + VAT =	**£240.35**
CPC464 Colour Monitor inc. FREE software	£301.00 + VAT =	**£346.15**

SANYO MBC 555 Business Computer

128K including Wordstar, Calcstar, Infostar	£795.00 + VAT =	**£914.25**

Acorn/BBC

→ Acorn Electron	£109.90 + VAT =	**£126.39**
→ BBC Model B	£289.00 + VAT =	**£332.35**
→ Model B inc Disk IF	£368.90 + VAT =	**£425.34**
→ Cumana 1x100K DD CSX100	£99.95 + VAT =	**£114.95**
→ Cumana 1x200K DD CSX200	£131.95 + VAT =	**£151.75**
→ Cumana 2x100K DD inc PSU	£227.90 + VAT =	**£262.09**
→ Cumana 2x200K DD inc PSU	£289.90 + VAT =	**£333.39**
→ Cumana 2x400K DD inc PSU	£344.90 + VAT =	**£396.64**

All above Cumana Disk Drives include Cable, Manual – form. disk.

Sinclair

QL 128K Computer	£334.74 + VAT =	**£384.95**
→ NEW Spectrum 48K PLUS	£106.91 + VAT =	**£122.95**
Microdrive + Interface 1 + 4 Free Programs	£82.60 + VAT =	**£95.00**
16K-48K Upgrade	£21.70 + VAT =	**£24.95**

MSX Computers

→ Toshiba HX10 64K	£189.90 + VAT =	**£218.39**
Sanyo MHC10 64K	£234.74 + VAT =	**£269.95**
→ Sony HB75B 64K	£245.00 + VAT =	**£281.75**
JVC HC7GB 64K	£226.04 + VAT =	**£259.95**

Full range of MSX accessories available

SUPERDISKS

LONDON'S LOWEST PRICES ON FLOPPY DISKS

Prices per box of ten ex VAT

	SSDD 40TR	DSDD 40TR	SS96TPI 80TR	DS96TPI 80TR
BASF 5¼"	**£10.95**	**£18.20**	**£19.80**	**£22.50**
3M 5¼"	**£13.55**	**£19.50**	**£20.05**	**£24.00**
VERBATIM 5¼"	**£14.50**	**£19.50**	**£19.50**	**£25.50**
DYSAN 5¼"	**£16.80**	**£24.90**	**£24.90**	**£32.00**
TDK 5¼"	**£17.50**	**£25.50**	–	**£33.00**

3M/BASF 3½"	**£34.90**

Add 70p for F&P per box of 10 disks

CASH & CARRY COMPUTERS

53-59 High Street, Croydon, Surrey CR0 1QD.

Apricot Computers

Fantastic Low Prices – All models in stock:
F1 • Apricot PC • Xi • Portable
PHONE NOW!

Mail Order + Export + Trade
Hot Line Phone 01-686 6362

Delivery by Securicor (3 day) please add £5.00 + VAT per item
Delivery by T.N.T. (overnight) please add £9.50 + VAT per item.

Send off the coupon or order by 'phone quoting your Access, Barclaycard No. 'Phone 01-686 6362. Immediate despatch on receipt of order or cheque clearance.

Or you can Telex your order on: 946240 Attn 19001385

We accept official orders from PLC's, Government Departments and Educational establishments.

These prices correct until superceded by next advertisement.

To: Cash & Carry Computers, 53-59 High Street, Croydon, Surrey CR0 1QD

Please supply _____

_____

I enclose my cheque for £_____ including delivery by Securicor/T.N.T.*

or charge my Access/Barclaycard No _____

Name _____ Signature _____

Address _____

_____ YC 3

*Please Delete (Vision Technology Ltd)

POP★TOPS

SOFTWARE TOP 20

		Game	Company	Machine
↑	1	Ghostbusters	Activision	Sp
↑	2	Daley Thompson's Decathlon	Ocean	Sp
•	3	Match Day	Ocean	Sp
↑	4	Booty	Firebird	Sp
•	5	Gift from the Gods	Ocean	Sp
•	6	Select 1	Computer Records	Sp
•	7	Airwulf	Elite	Sp
↓	8	Knight Lore	Ultimate	Sp
↑	9	Combat Lynx	Martech	Sp
↓	10	Underwurlde	Ultimate	Sp
↓	11	Elite	Acorn	Bc
•	12	Starter Pack	Tynesoft	16
•	13	Savage Pond	Argus	El
↓	14	Fall Guy	Elite	Sp
↓	15	Wild Bunch	Firebird	Sp
•	16	Hunchback II	Ocean	Sp
•	17	Overdrive	Superior	El
↓	18	Skoolidaze	Microsphere	Sp
↓	19	Steve Davis Snooker	CDS	Sp
↓	20	Danger Mouse in Double Trouble	Creative Sparks	Sp

Sp = Spectrum/Bc = BBC/15 = C16
El = Electron/Vc = Vic 20
Dr = Dragon/64 = CBM 64
Am = Amstrad/Or = Oric/At = Atari
• = New release/— = Same position
Source: WH SMITH

SOFTWARE TOP 3 BY MACHINE

		Game	Company	Machine
—	1	Snooker	Visions	Vc
—	2	Wax	Anirog	Vc
↓	3	Duck Shoot	M. Tronic	Vc
—	1	Kong Strikes Back	Ocean	64
	2	Hunchback II	Ocean	64
	3	Ghostbusters	Activision	64
—	1	Match Day	Ocean	Sp
↑	2	Gift from the Gods	Ocean	Sp
↓	3	Hunchback II	Ocean	Sp
↑	1	Chuckie Egg	A&F	Dr
↑	2	Hunchback	Ocean	Dr
—	3	Cuthbert in Space	Microdeal	Dr
	1	747 Simulator	Doctorsoft	Bc
—	2	Mr EE	Micropower	Bc
—	3	Horse Lord	Century	Bc
↑	1	Encounter	Hi-Tech	At
—	2	Zaxxon	Centresoft	At
↓	3	Solo Flight	Centresoft	At
↑	1	Crazy Golf	Commodore	16
↑	2	Stellar Wars Blitz	Commodore	16
↑	3	Flight 015	Crag Comm	16
↑	1	Dare Devil Dennis	Melbourne House	El
—	2	Chuckie Egg	A&F	El
↓	3	Snooker	Visions	El
↑	1	Football Manager	Addictive	Am
—	2	Star Commando	Terminal	Am
—	3	Ghouls	Micropower	Am

Source = Websters Software

YOUR Letters

MTX IS OK!

WHEN WILL games writers and micro buyers realise the potential of the Memotech series? Consider the Memotech MTX 500, bottom of the range. At a price of £199 it is MSX quality, though is not compatible with the MSX micros.

If you consider it is only £20 more than the Spectrum +, at £179, which would you buy? The MTX 500 has as much as the Spectrum + and more, i.e.:

- Higher colour resolution
- Built in assembler/disassembler.
- Sprite graphics.
- A far superior keyboard.
- 16 colours compared to the Spectrum +'s eight.
- Built in text formatting — Noddy.
- Faster operating speed.
- Louder and better sound, played through the TV's loudspeaker.
- Logo type graphic commands.
- Two joystick ports.
- Centronics/RGB/HiFi etc. ports.
- Separate Ram reserved for graphics.

So come on all you games writers and micro buyers — Think.

M E Hodges,
Shipham,
Somerset.

DATACALC BUGS

THANK YOU for publishing my article Datacalc. There are two or three errors pointed out to me since the publication, and perhaps you would be kind enough to publish the following amendments.

- If DFS is fitted then line 100 should read: 100 N1 = 45: etc.
- To use trigometrical functions in the formulae the line 1725 should be added,
  1725 IF MID $ (B$, x, 3) = "SIN" OR MID $ (B$, x, 3) = "COS" THEN C$ = C$ + MID$ (B$, x, 3) : x = x + 3 : GOTO 1720.
- In line 1770 I have used the function VAL to evaluate the value of f, I should of course have used EVAL, therefore Line 1770
  C$ = C$ – EVAL MID$ (F$(" + x $ + ";" + STR$ EVAL "(F)" + ", 8)".
- I have omitted to return the printing width to its default value after a printing operation, therefore line 4875 should be: 4875 VDU3 : WIDTH0.

Brian Law,
Leicester.

SCREEN STORE

I HAVE SEEN many programs for the Spectrum which store the screen in memory and then reprint it on request very quickly. The following program will do the same thing on the Amstrad CPC 464 computer. I advise that you only use the routine to store one screen as these screens, being more complex than their Spectrum counterparts, require more memory. Do not be fooled by the size of the routine as it uses one of the powerful features of the Z-80, that being its ability to move blocks of memory about. The routine will save any screen in any mode including colours if they are used.

To use the routine simply Call (ad+9) to store a screen and then Call (ad) to reprint it. The routine is especially useful when changing mode after drawing a complex screen, knowing that returning to that same screen will require tedious redrawing of it. Care should be taken not to get the Call number mixed up as calling the store routine instead of the draw routine will result in the precious screen being replaced with whatever is on the screen at the time of the Call.

Type in the program as below but when you have tested it you may save it in the method described on page 42 of the manual. Once the routine has been saved in the form of bytes it can be loaded and added to your program on its own.

```
10 LET ad = 24550.
20 FOR n = 0 TO 24:READ a:POKE
   n + ad,a:NEXT
30 REM Print = ad * Store
   = ad + 9
40 DATA &f3,33,00,96,17,00,192,
   &18 8,&f3,33,00,192,17,00,96,
   0,0,7,00 64,&ed,&bc,&fb,201
```

David Channon,
Welton Park,
C'Field.

ERROR NEWS

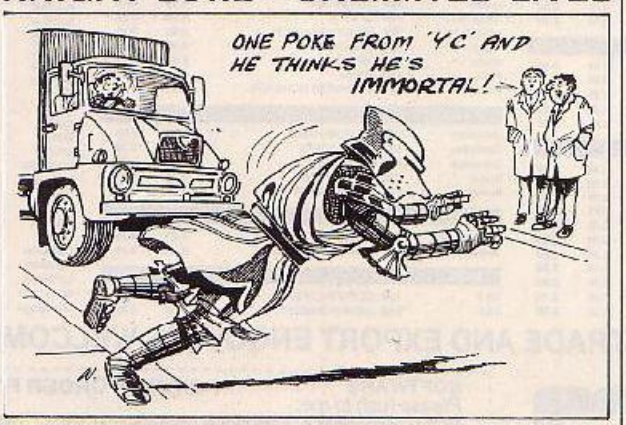
THERE HAS been an error in the article with my program Newsmonger. An important Poke command has been omitted and there was a misprint. After the sentence Poke 16511,66 N/L there should be printed:

POKE 16512,2 N/L

and you have created line 0 with a Rem containing 576 bytes.

Frans Zym,
Holland.

KNIGHT LORE—UNLIMITED LIVES



I'M WRITING to you because after spending two hours totally isolated hacking my way through over 10K of machine code I can finally reveal a way of making Ultimate's masterpiece Knight Lore easier.

Just load the code from tape, enter Poke 53567,0 and run it using USR. Now play the game and — surprise! — you won't lose any lives.

I can also reveal how to finish Jet Set Willy easily. Load the code using Clear 32767:Load""Code and enter Poke 41983,255: Print USR 33792. There will be just one object in the house — in the bathroom — so pick it up and go to bed.

Pedro Fernandes,
Portugal.

"BBC IS BEST"

I READ WITH some amusement Steven Hill's answer to a reader's letter concerning the QL and BBC. Having used both machines where I work I feel I can set the record straight.

For a start the claim that the QL's graphics are four times faster than the BBC's is nonsense. Perhaps Mr Hill made an error and read his time in days instead of seconds, because the BBC's graphics and Basic in general are much faster than the QL's. The scrolling is a case in point. Although the QL's Pan and Scroll commands are easier to use than the BBC's VDU23, the latter's scrolling is instantaneous due to its hardware nature. The QL scrolling is very sluggish and in order to achieve some semblance of smoothness the user has to resort to machine code.

How do you do that? Easy on a BBC, the excellent built-in assembler allows assembly mnemonics to be mixed with Basic. QL users will have problems.

As for the "outstanding technical achievement" line, Mr Hill has

(continued on page 27)

SOFTWARE 50% OFF GIGANTIC SALE

OFFER AVAILABLE ONLY WHILE STOCKS LAST!

Many of the top cassette based titles for all the popular makes of computers offered with over 50% discount.
No messing, full money back guarantee if not highly delighted.
SEND FOR FREE 'descriptive' brochure on all titles available.

Producer	Item No.	Title	RSP inc. VAT £	Sale Price £
BBC				
Cascade	1	CASSETTE 50	9.95	3.99
Imagine	2	BC BILL	5.50	2.59
Imagine	3	PEDRO	5.50	2.59
Micro Power	4	DANGERUXB	7.95	1.79
Micro Power	5	THE MINE	7.95	4.79
Ocean	6	MR WIMPY	6.90	3.29
DIC	7	DOGGY DEALER	6.50	3.29
Quicksilva	8	BEEB ART	14.95	7.99
Quicksilva	9	MUSIC PROCESSOR	14.95	7.99
Superior	10	COSMIC KID	7.95	3.79
Virgin	11	CHECKOUT	7.95	5.19
Visions	12	DEMOLATOR	6.95	3.29
Visions	13	PENGI	6.95	3.29
BBC & ELECTRON				
Lothlorien	14	THE STOLEN LAMP	6.95	3.29
COMMODORE				
Anirog	15	BONGO	7.95	4.99
Anirog	16	CYBOTRON	7.95	4.99
Anirog	17	PETCH	6.95	3.99
Anirog	18	SPACE PILOT	7.95	4.29
CRL	19	DERBY DAY	7.95	4.29
CRL	20	OMEGA RUN	7.95	4.29
CRL	21	WHIRLYBIRD	7.95	4.29
DKTronics	22	SPEED DUEL	6.95	2.99
Games Machine	23	SKULL	7.95	3.79
Imagine	24	ARCADIA	6.50	2.60
Imagine	25	BC BILL	5.50	2.59
Imagine	26	COSMIC CRUISER	5.50	2.59
Interceptor	27	TROLLIE WALLIE	7.00	3.79
Interceptor	28	WALLIE RHYME LAND	7.00	3.79
Interceptor	29	WHERE'S MY LONES	7.00	3.79
Melbourne House	30	CLASSIC ADVENTURE	6.95	3.99
Melbourne House	31	HORACE GOES SKIING	5.95	3.59
Micro Power	32	SWOOP	6.95	4.29
Phoenix	33	ATTACK ON WINSCALE	6.95	3.49
Phoenix	34	QUEST FOR GARDEN OF EDEN	6.95	3.49
Phoenix	35	THE SORCERERS APPRENTICE	6.95	3.49
Quicksilva	36	AQUAPLANE	7.95	4.29
Quicksilva	37	BOOGABOO THE FLEA	7.95	4.29
Quicksilva	38	HELI	7.95	4.29
Quicksilva	39	TRAFFIC	7.95	4.29
Taskset	40	GYROPOD	6.95	3.29
Taskset	41	JAMMIN	6.95	3.29
Terminal	42	HUNTER	7.95	3.79
Terminal	43	SUPER SKRAMBLE	7.95	3.79
Terminal	44	TOURNAMENT	7.95	3.79
Thor	45	3DSILICON FISH	5.95	2.99
Virgin	46	AMBUSH	7.95	5.59
Virgin	47	FALCON PATROL	6.95	4.99
COMMODORE & VIC 20				
Anirog	48	LAS VEGAS	5.95	3.59
Anirog	49	TOM THUMB	5.95	3.59
Cascade	50	CASSETTE 50	9.95	4.69
Imagine	51	BC BILL	5.50	2.59
Imagine	52	COSMIC CRUISER	5.50	2.59
Imagine	53	PEDRO	5.50	2.59
ELECTRON				
Micro Power	54	DRAW	8.95	5.49
Lothlorien	55	JOHNNY REB	6.95	3.49
Micro Power	56	FELIX IN THE FACTORY	6.95	3.99
Sharpsoft	57	BUGS	6.95	3.29
Sharpsoft	58	RAID	6.95	3.29
SPECTRUM				
Anirog	59	KONG	5.95	3.29
Arcade	60	BUBBLE TROUBLE	5.50	2.99
Arcade	61	THE PRIZE	5.50	2.99
Artic	62	MR WONG'S LAUNDRY	6.95	3.29
DugByte	63	CAVERN FIGHTER	5.95	3.29
BugByte	64	COMP COOK BOOK	9.50	5.19
Cascade	65	CASSETTE 50	9.95	4.69
CDS	66	POOL	5.95	2.99
CDS	67	WINGEDWAR LORDS	5.95	2.99
CRL	68	3DDESERT PATROL	4.95	2.99
CRL	69	AHHH!!!	5.95	3.39
CRL	70	GLUGGLUG	5.95	3.39
CRL	71	HANDICAP GOLF	5.95	3.39
CRL	72	OLYMPICS	5.95	3.39
CRL	73	PANDEMONIA	5.95	3.39
CRL	74	THE OMEGA RUN	5.95	3.39
Crystal	75	HALLS OF THE THINGS	7.50	3.99
Crystal	76	THE DUNGEON MASTER	7.50	3.99
DKTronics	77	SPEED DUEL	5.95	2.99
DKTronics	78	ZIG ZAG	5.95	3.39
Games Machine	79	SKULL	5.95	3.59
Gargoyle	80	AD ASTRA	5.95	2.99
Imagine	81	ARCADIA	5.50	2.59
Imagine	82	BC BILL	5.50	2.59
Imagine	83	COSMIC CRUISER	5.50	2.59
Imagine	84	JUMPING JACK	5.50	2.59
Imagine	85	PEDRO	5.50	2.59
Lothlorien	86	MICROMOUSE	5.95	2.99
Melbourne House	87	MUGSY	5.95	3.99
Melbourne House	88	PENETRATOR	5.95	3.99
Micromega	89	DEATHCHASE	5.95	3.39
Ocean	90	CHINESE JUGGLER	5.90	2.99
Ocean	91	ESKIMO EDDIE	5.90	2.99
Ocean	92	GILLISAN'S GOLD	5.90	2.99
Ocean	93	MOON ALERT	5.90	2.99
Phoenix	94	JOKER'S WILD	6.99	3.29
Quicksilva	95	ANT ATTACK	5.95	3.79
Quicksilva	96	BOOGABOO THE FLEA	5.95	3.79
Quicksilva	97	DRAGONSLANE	5.95	3.79
Quicksilva	98	FRED	5.95	3.79
Quicksilva	99	LASERZONE	5.95	3.79
Quicksilva	100	SNOWMAN	5.95	3.79
Virgin	101	RACING MANAGER	5.95	4.29
Virgin	102	SORCERY	5.95	4.29
Visions	103	1984	5.95	3.29
Visions	104	SOG	6.95	3.29
VIC 20				
Anirog	105	MAX	6.95	2.39
Bug Byte	106	SCRAMBLE	6.95	3.69
Cascade	107	CASSETTE 50	9.95	4.69
Imagine	108	ARCADIA	5.50	2.99
Interceptor	109	CRAZY KONG	6.00	3.19
Interceptor	110	WUNDA WALTER	6.00	3.19
Phoenix	111	FOUR GATES FREEDOM	6.99	4.49
Quicksilva	112	SKYHAWK	7.95	4.29
Quicksilva	113	SUBSPACE STRIKER	7.95	4.29
Quicksilva	114	TORNADO	5.95	3.19
Terminal	115	GRIDDER	6.95	3.29
Terminal	116	PINBALL WIZARD	6.95	3.29
Terminal	117	SKRAMBLE	6.95	3.29
Thor	118	3D SILICONFISH	5.95	2.99
Thor	119	LUV BUG	5.95	2.39
Thor	120	OLLY	6.95	3.29
Virgin	121	CREEPERS	5.95	4.19
Visions	122	SNOOKER	6.95	4.29
ORIC-ATMOS				
CRL	123	ESCAPE MANHATTAN	6.95	3.79
Durell	124	HARRIER ATTACK	6.95	3.29
Durell	125	SCUBA DIVE	6.95	3.29
Lothlorien	126	DIGGER	6.95	3.29
Lothlorien	127	SPOOKY MANSION	6.95	3.29
Ocean	128	HUNCHBACK	6.90	3.29
Ocean	129	MR WIMPY	6.90	3.29
PSS	130	MARC	6.95	3.29
Romik	131	LOCH NESS MONSTER	6.99	3.29
ZX81				
Lothlorien	132	MICROMOUSE	5.95	2.99
Quicksilva	133	QS INVADERS	3.95	2.19
Quicksilva	134	QS SCRAMBLE	3.95	2.19
Romik	135	BANK ROBBER	4.99	2.49
Romik	136	GALAXY JAILBREAK	4.99	2.49
AMSTRAD				
Micro Power	137	GHOULS	6.95	4.19
Terminal	138	STAR COMMANDO	8.95	4.19
BBC				
A & F	139	COPTER CAPERS	6.90	3.99
A & F	140	HAUNTED ABBEY	6.90	3.99
Acornsoft	141	FACEMAKER	9.95	5.99
Acornsoft	142	HIDE AND SEEK	9.95	5.99
Acornsoft	143	LETTER SQUIRT	9.95	5.99
Acornsoft	144	NUMBER CHASER	9.95	5.99
Acornsoft	145	NUMBER GULPER	9.95	5.99
Acornsoft	146	NUMBER PUZZLER	9.95	5.99
Acornsoft	147	TABLE ADVENTURE	9.95	5.99
Acornsoft	148	WORDS WORDS WORDS	9.95	5.99
Alligata	149	CHART BUSTER	9.95	5.29
Alligata	150	DOUBLE ADVENTURE	7.95	4.19
Alligata	151	SON OF BLAGGER	7.95	4.19
Alligata	152	SPITFIRE FLIGHT SIMULATOR	7.95	4.19
Alligata	153	STARSHIP DISCOVERY	7.95	4.19
Alligata	154	TARZAN	7.95	4.19
Alligata	155	UNCLE CLAUDE	7.95	4.19
Big Byte	156	TWIN KINGDOM VALLEY	9.50	5.19
Level 9	157	COLOSSAL ADVENTURE	9.90	5.29
Level 9	158	LORDS OF TIME	9.90	5.29
Level 9	159	SNOWBALL	9.90	5.29
Lothlorien	160	CONFRONTATION	7.95	3.99
Micro Power	161	CYBERTRON MISSION	7.95	4.69
Micro Power	162	GALACTIC COMMANDER	7.95	4.69
Micro Power	163	GHOULS	7.95	4.69
Micro Power	164	INTERGALACTIC TRADER	6.95	4.69
Micro Power	165	KILLER GORILLA	7.95	4.69
Micro Power	166	STOCK CAR	7.95	4.69
Romik	167	ALIEN BREAKIN	6.99	3.29
Romik	168	BIRDS OF PREY	6.99	3.29
Superior	169	HUNCHBACK	7.95	3.99
Superior	170	OVERDRIVE	7.95	3.99
Superior	171	STAR STRIKER	7.95	3.99
Superior	172	WALLABY	7.95	3.99
Visions	173	DARE DEVIL DENNIS	7.95	3.99
Visions	174	SNOOKER	8.95	4.19
Wilcox	175	BLUE THUNDER	8.95	3.29
ELECTRON				
A & F	176	CYCLON ATTACK	7.00	4.19
Alligata	177	BLAGGER	7.95	4.19
Micro User	178	OLYMPICS	5.95	2.99
Ocean	179	HUNCHBACK	6.90	3.29
Romik	180	ALIEN BREAKIN	6.99	3.29
Romik	181	ATOM SMASHER	6.00	3.29
Romik	182	BIRDS OF PREY	6.99	3.29
Romik	183	CATERPILLAR	6.99	3.29
Romik	184	SHARK ATTACK	6.99	3.29
Superior	185	MR WIZ	7.95	3.79
SPECTRUM				
A & F	186	CHUCKIE EGG	6.90	3.79
Acorn	187	ENGINEER HUMPTY	6.95	3.29
Artic	188	HUMPTY IN THE GARDEN	6.95	3.29
Artic	189	HUMPTY MEETS FUZZYWUZZY	6.95	3.29
Artic	190	ON THE OCHE	6.95	3.29
Artic	191	WORLD CUPFOOTBALL	6.95	4.79
Beyond	192	LORDS OF MIDNIGHT	5.95	3.79
Beyond	193	PSYTRON	5.95	3.79
Beyond	194	SPELLBOUND	5.95	2.99
Big Byte	195	ANTICS	6.95	3.79
Big Byte	196	MANIC MINER	5.95	3.19
Big Byte	197	POOL	5.95	3.79
Big Byte	198	RAPSCALLION	6.95	3.79
Big Byte	199	STAR TRADER	6.95	3.79
Big Byte	200	TWIN KINGDOM VALLEY	7.95	4.19
Digital	201	FIGHTER PILOT	7.95	4.19
Digital	202	NIGHTGUNNER	5.95	3.79
Durell	203	HARRIER ATTACK	5.95	2.99
Durell	204	SCUBA DIVE	5.95	2.99
Imagine	205	STONKERS	5.50	2.99
Interceptor	206	FOREST WORLD'S END	5.50	2.99
Interceptor	207	TILER	5.50	2.99
Kemian	208	TURBO CHESS	5.95	2.99
Level 9	209	COLOSSAL ADVENTURE	9.90	5.29
Level 9	210	LORDS OF TIME	9.90	5.29
Level 9	211	SNOWBALL	9.90	5.29
Lothlorien	212	CONFRONTATION	7.95	3.79
Lothlorien	213	CONFRONTATION SCEN	5.95	2.99
Lothlorien	214	SPECIAL OPERATION	5.95	2.99
Micro User	215	OLYMPICS	5.95	2.99
Micromega	216	CODENAME MAT	6.95	3.39

★★★★★★★★★★★★ TRADE AND EXPORT ENQUIRIES WELCOME ★★★★★★★★★★★★

Guarantee

All of the products offered for sale by Philips & Philips Co. Ltd. are fully guaranteed, all are offered as perfects and are available for immediate delivery, direct from stock.

01 446 5648

NEW TITLES ARRIVING DAILY – send for free brochure

SOFTWARE PRIORITY ORDER FORM

Please rush to me:
FREE 'descriptive' catalogue (please tick) YES ☐ NO ☐

Computer make and model _____

The following titles: (Quote item number)

Item No.	*Unit Price*	*Quantity*	*Total*
		TOTAL	

Postage and Packing FREE with orders over £10.
Orders under £10 – carriage 50p per order.
Please find enclosed full remittance of £ _____
Please debit my Access/Barclaycard No. _____

Signature _____
Name _____
Address _____

Tel No. _____

PHILIPS & PHILIPS CO LTD Scriptomatic House, Torrington Park, Finchley, London N12 9QU

IN ★ TOUCH

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticisms of machines and software in general. Here's how you go about getting your name into print. Your article should be typed, double-spaced, on A4 paper. A name and address on each sheet would help. Don't forget to tell us which machine it runs on. With programs please include a cassette or disc and some indication of how long it is. Please put what machine it's for on the envelope. Don't forget full instructions to us how to load and list your program and how to enter it for the readers.

Telsoft

Telsoft is *Your Computer's* software downloading service. Any program for the Spectrum or the BBC — and soon the Commodore — which has a telephone symbol next to it is available on the service. Both 1200 and 300 baud speeds are catered for. For more details call Colchester (0206) 8068. No more lonely nights typing in endless pages of hex digits.

Message service

You can get messages to us in two ways. Either use the Prestel Telex Link to 892084 BISPRES G or you can use our very own modem, day or night on 01-661 8978. The modem is V21, 300 baud, even parity, 10 bits per character. You simply transmit in upper case "YRC" — our address code, and wait for the acceptance code "++ STF GO". Then off you go. Don't forget to tell us who it's for. Sign off with "NNNN" — again in upper case.

YOUR Letters

(continued from page 25)

obviously never looked underneath a BBC Micro. With its multitude of interfaces and ports the BBC allows the connection of virtually any peripheral.

The BBC beats the QL in other areas too — better sound, higher resolution, better keyboard, more reliable, more inbuilt features such as interrupt software and Rom routines and much better after-sales service.

Graham Walkden,
Banchory,
Kincardine.

DIGGER DIG

IN MONSTER DIGGER — *Your Computer*, December 1984 — the author, Michael Pike, warns against typing in the line number of the line immediately after the Rem as this will cause line 0 to be listed over and over again. He ascribes this to a "bug in the Rom". It is nothing of the sort and is, in fact, the normal response of the ZX-81 when you Poke an incorrect line length into a program line.

The nine Rem statements as described for lines 1 to 9 — 10 full lines of zeroes — would each consist of Rem followed by 314 — not 320 — zeroes, and each line would contain a *total* of 320 bytes made up of line number, line length, Rem, 314 zeroes and Newline. Combining these nine lines into a single Rem statement will produce a line containing 2876 bytes — not 2816 as stated in the article — and this will be achieved by Poke 16511,60; Poke 16512,11.

If an invalid line length is Poked into 16511/12, then repetitive listing of the sort described will occur on attempting to delete the following line. It is probably worth checking, when combining lines in this way, that:

```
PRINT PEEK (16512 + PEEK 16511
+ 256 * PEEK 16512)
```

does give the correct answer 118 for the Newline character at the end of the line.

N F Cunningham,
Ripley,
Surrey.

ASCII FILES

I RECENTLY HAD contact with Sinclair Research regarding a particular phenomenon with the QL and Microdrives. I had created and saved a program onto Microdrive and, on reading the number of sectors used — namely 42, assumed that the program was 21K in length. However, when the program was loaded back, the Basic pointer had moved half as much again, some 31K. The explanation was given as follows:

"A program is saved on Microdrive as an ASCII file, therefore when it is loaded it is tokenised and routine addressed appended. For example, the word Print (five bytes) is tokenised into two bytes, plus a four byte address means an extra byte is used. In fact, it appears that the user has 86K bytes available for program size as long as no new channels are used and certain print options not used."

You can build a program as a data file, and if no line numbers are used and the file is LRun, the program runs, but cannot be listed — nothing to list. To do this create the following program:

```
1 INPUT 'NAME', file$
2 OPEN-NEW # 5;'mdvl-' &file$
4 REPeat build
5 INPUT L$:IF L$ = = 'STOP':EXIT
build
6 PRINT # 5;L$
7 END REPeat build
8 Close # 5
```

Note line 5, two points, the first is the double =, this make the entry case independent, and secondly, a colon can be used instead of Then. If you run the program and for example input the following:

```
Paper 0: INK 6: cls
Fill 1. circle 100,50,50.fill 0
Stop
```

and you called the file "test": if you Lrun mdvl-test a filled circle will appear. This idea can be extended:

```
1 INPUT 'NAME', file$
2 OPEN-NEW # 5;'mdvl-' &file$
3 lno = 10
4 REPeat build
5 INPUT(lno);' ';L$:if L$ = = 'STOP':
  EXIT build
6 PRINT # 5;lno " ";L$:
  lno = lno + 10
7 END REPeat build
8 Close # 5
9 MRUN'mdvl-' &file$
```

Your program is tacked onto the end of this one.

B G Cornhill,
Aylesbury.

CORRECTIONS

Lines 2266 to 2294 and line 2185 we left out of the listing for Mars Buggy in the February issue. They are given below. Enter the letters in upper case.

```
2266 dataff,ff,ff,ff,ff,ff,ff,ff
2267 data7c,fe,c6,fe,c6,c6,c6,00
2268 datafc,e6,c6,fc,c6,e6,fc,00
2269 data7c,e6,c0,c0,c0,e6,7c,00
2270 data78,ec,c6,c6,c6,ec,78,00
2271 data7e,e0,c0,f8,c0,e0,7e,00
2272 data7e,e0,c0,f8,c0,c0,c0,00
2273 data7c,e6,c0,ce,c6,e6,7c,00
2274 datac6,c6,c6,fe,c6,c6,c6,00
2275 datafc,30,30,30,30,30,fc,00
2276 data7e,3c,0c,0c,0c,6c,38,00
2277 datac6,ec,f8,f0,f8,ec,c6,00
2278 datac0,c0,c0,e0,e0,e0,7e,00
2279 data44,ee,fe,d6,c6,c6,c6,00
2280 data46,f6,fe,fe,ee,e6,46,00
2281 data7c,f6,e6,e6,e6,e6,7c,00
2282 data7c,f6,e6,fc,e0,e0,60,00
2283 data7c,c6,c6,c6,66,3c,0e,00
2284 data7c,c6,c6,fc,f8,cc,46,00
2285 data7c,c6,c0,fc,06,e6,7c,00
2286 datafe,98,18,18,18,18,18,00
2287 data44,c6,c6,c6,c6,c6,7c,00
2288 data00,00,00,00,00,00,00,00
2289 datac6,c6,c6,c6,e6,7c,38,00
2290 datac6,c6,d6,d6,fe,d6,82,00
2291 data66,66,3c,18,3c,66,66,00
2292 data44,ff,00,ff,00,ff,00,ff
2293 data00,ff,00,ff,81,4c,44,41
2294 data00,00,00,00,03,00,00,00

2185 data3e,03,ac,56,03,b9,00,40
```

In the same issue the hex loader for Spectrum Synsounds and Spraymania contains a few errors. To correct it insert lines 75 and 115, and change line 100:

```
75 LET x = 0
100 POKE n + x,z
115 LET x = x - 1
```

"THE DRAGON ISN'T PUFFED OUT".

ONE WONDERS where the software houses think we Dragon owners have gone to. When the manufacturer goes bust and is sold off to some Spanish company, the hapless computer owner doesn't throw his machine in the bin and replace it with the latest offering. No, he carries on as normal.

There is no alternative. In the case of the Dragon, the computer represents a capital cost of somewhere between £150 and £230, depending on the time of purchase and the model.

Second, there is no obviously better computer. I own a Dragon 64 running on OS-9. This Unix-based, multitasking operating system has no equal in the home computer world. Using the stylograph word processor I can do in 20 seconds that it took Kathleen Peel over three minutes to do using Quill on a QL.

David Ferguson,
Wendover,
Buckinghamshire.

COMCON

Programmable Joystick Interface for the Spectrum

£19.95

incl. VAT and P & P

Simple and fast programming. Plug the six function connectors into the required Spectrum key positions. Ready!

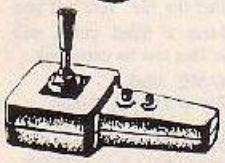
Two independent fire actions. Photon Blasters and Neutron Bombs at the touch of your fingertips.

Extension port for Curran Micro-speech unit. Combine joystick with sound and speech for ultimate arcade action.

Compatible with all Atari type joysticks including Quickshot II (without rapid fire action).

Interface operates joystick parallel to keyboard. Joystick action compatible with any add-ons including Microdrives.

QUICKSHOT 2+2 JOYSTICK modified to incorporate 2 independent fire actions and no rapid fire option **£13.95** incl. VAT and P & P



FLIGHTLINK JOYSTICK with 2 independent fire actions **£10.50** incl. VAT and P & P

CURRAH µSPEECH UNIT fits into COMCON extension slot **£29.95** incl. VAT and P & P

Dealer Enquiries Welcome
Phone Ludlow (0584) 4894

ALSO AVAILABLE FROM SELECTED RETAIL OUTLETS

FREL LTD. Send to Hockeys Mill, Temeside, Ludlow, Shropshire SY8 1PD

Mr/Mrs/Miss _____

Address _____

_____ Postcode _____

Qty	Code	Item	Item Price	Total £
	01	Comcon Interface	@ £19.95	
	02	Flightlink Joystick	@ £10.50	
	03	Quickshot 2+2 Joystick	@ £13.95	
	04	Comcon + Quickshot 2+2	@ £31.90	
	05	Comcon + Flightlink	@ £28.45	
	06	Curran µSpeech unit	@ £29.95	

I enclose a cheque/postal order made payable to FREL LTD for £

COMCON

Educational Software LCL

BBC Micro
Tape, 40/80 track Disc, Econet compatible.
ZX Spectrum
Commodore 64
Electron
unexpanded Vic
ZX81 • Apple • PET
✱ N.E.C.-P.C. 8201A ✱ NEW
Dragon (book only)
All software for the above computers.

IMMEDIATE DISPATCH

MICRO ENGLISH (BBC, Electron). Complete English Language self-tuition and revision course, to O-Level, of 24 programs. Includes "speak-and-spell" real speech (no extras required). £24.50.
MICRO MATHS 24 program revision or self-tuition course to O-Level. £24.50 (except ZX81 £12.00).
SIR FRANCIS DRAKE ADVENTURE GAME. Authentic, historical, graphics adventure game. £6.50.
ANIMATED ARITHMETIC Teaches using moving colour pictures (not words) Ages 3-6. £6.50 (disc £7.50).
BRAINTEASERS Book of IQ tests & puzzle programs. £5.95 "... *excellent*" EDUCATIONAL COMPUTING.

*Immediate dispatch Micro Maths, Micro English and Master Maths. Phone or send orders or requests for free exhibition leaflet (300 programs) to:

LCL
26 Avondale Ave.
Staines, Middx.
Tel: 0784 58771
24 hrs. Orders

World leaders in educational software (distributors in 24 countries.)

Access VISA

TRADE DISCOUNTS NEW HOTLINE SERVICE

AS SEEN ON TV

EXPORT

ALL MAKES
OF
MICROCOMPUTERS
PRINTERS
PERIPHERALS
AND
SOFTWARE
SUPPLIED AT
DISCOUNT PRICES

MICROGOLD

UNICOM HOUSE
182 ROYAL COLLEGE STREET
LONDON NW1 9NN

Telex: 295931 UNICOM G **Tel: 01-482 1711**

I could do that...

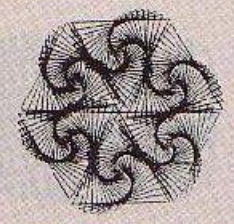
January's problem asked you to write a 10 line program which created an interesting or artistic pattern. We awarded the £15 prize to P. Duyvesteyn, Wijnruitgaarde 30, 3436 HR Nieuwegein, The Netherlands. His program is written in Simons Basic for the Commodore 64.

It allows you to create a variety of different patterns by altering a few parameters. Adapting it to run other machines should not prove too difficult. You will need to change line 170 which takes two pairs of coordinates and draws a line between them. The Commodore 64 has a resolution of 320 by 200 so the figures 160 and 100 position the pattern in the centre of the screen.

For this month's competition we would like you to write a program which modifies itself. To do this you will need to find out how your version of Basic stores its program lines, and you will undoubtedly have to use Peeks and Pokes.

Programming purists will tell you that self-modifying code is a "dirty" programming technique. But it can produce some entertaining effects such as a program that extends itself by a given number of lines every time it is run. Your program should not have more than 20 single statement lines.

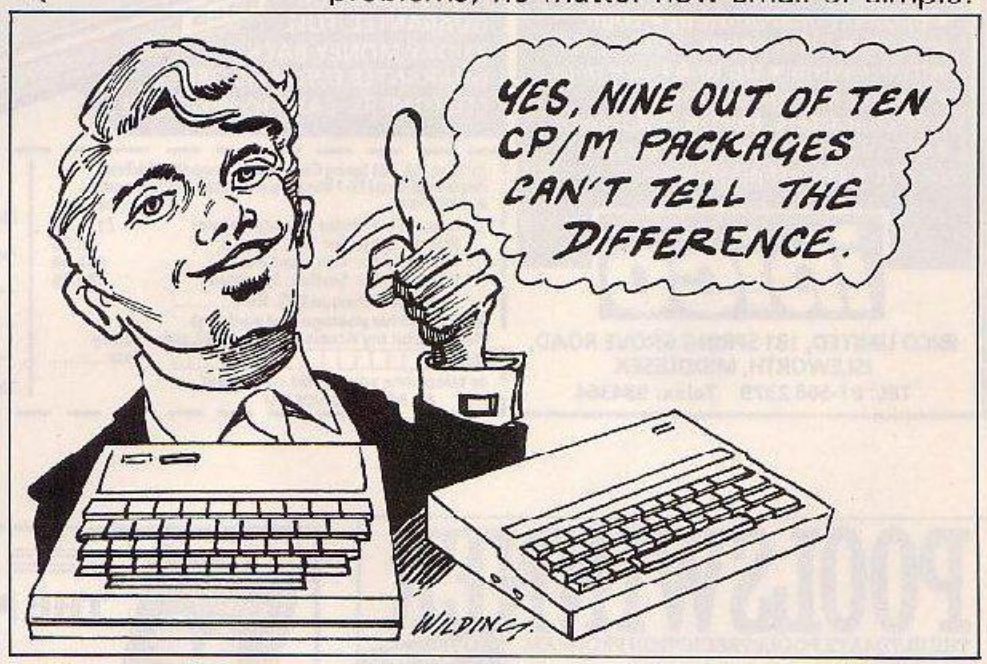
```
104 INPUT"LENGTH              ";L:
    INPUT"GROWTH OF LENGTH";GL
110 INPUT"ANGLE               ";A:
    INPUT"GROWTH OF ANGLE ";GA
120 INPUT"NUMBER OF SIDES ";S:
    INPUT"ROTATION ANGLE  ";RA
130 P=π/180 A=A*P:GA=GA*P:RA=RA*P:X=0:
    LH=L:H=A:IFABS(RA)>0THENP=1.9999*π/
140 :
    :HIRES1,0
150 ::::FORJ=0TOP STEP RA   :FORI=1TOS
160 ::X1=X0+LH*COS(H):Y1=Y0+LH*SIN(H)
    :Y1=Y0+LH*SIN(H):X0=X1:Y0=Y1:MXRA)
170 :LINEX0+160.5,Y0+100.5,X1+160.5,
    Y1+100.5,1
180 :X0=X1:Y0=Y1:LH=LH+GL:H=H+GA:N=N+1
190 ::::NEXT:M=M+1:LH=L:H=H+A:X0=0:Y0=0:
    ::::N=0                   :NEXT
200 GOTO200
```



```
L= 95 :GL=-1.5 ;A= 62.5
GA= 0 :S= 65 ;RA= 60
```

BEGINNERS *first bytes*

Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.



What does CP/M do?

OPERATING SYSTEMS were discussed in January's First Bytes, where it was explained how they carried out all the boring housekeeping functions on a micro. One of the most widely-used operating systems is CP/M. And for eight-bit home and business micros it definitely rules the roost.

CP/M stands for Control Program for Microcomputers — which sums up neatly just what it and other operating systems do. The story of its development is one of those fairy tales that seem so common in the magic world of micros.

CP/M was written because its inventor, Gary Kildall, wanted to hook up some early floppy disc drives to an equally early eight-bit microprocessor system. In those far-off early days of micros — that is about 10 years ago — if you wanted something like this you had to write it yourself. Which is what young Gary did, in his garden shed in fact. The resulting product was not very elegant, but it worked.

It occurred to Kildall that other micro enthusiasts might be interested, so he told the big semiconductor firm Intel, who he was working for at the time, about his little idea. They scoffed at the preposterous suggestion of bothering to write an operating system for a mere micro. After all, IBM itself had let it be known that it thought micros were merely a passing fad.

But like all good fairy stories, the CP/M story has a happy ending — though not for Intel. Kildall first put a few ads in computer magazines, and sold increasing numbers of his system.

In fact he started selling so many that he set up his own firm, Digital Research, just to market and sell CP/M. Today he is a multi-millionaire, and his firm produces a whole range of software products.

So why did everyone — apart from Intel — get so excited about CP/M? Mostly because it happened to be in the right place at the right time. It certainly wasn't a stunningly beautiful piece of programming: even today, the product is not very user-friendly, and can be bafflingly obscure. And it certainly wasn't simply because of hype and brilliant marketing: to begin with, Kildall almost had to be coaxed into selling it at all.

But CP/M offered first the possibility of using disc-drives with one of the new processors. As January's article explained, looking after the discs and input and output of information is one of the prime jobs of an operating system, sometimes also known as a disc operating system.

But the second big advantage was that CP/M offered for the first time a general standard that everyone could use to swap discs and therefore programs. Before CP/M, everybody and every manufacturer concocted their own weird and wonderful disc operating systems.

Unfortunately, this meant that the user was very much locked in to that particular system. Today only giants like Apple can still use their own non-standard operating system and get away with it. Practically everyone else uses one like CP/M.

In this way a huge library of software running under CP/M has been built up; it currently stands at something over 3000 packages. Running "under" CP/M simply means that while the software contains all the interesting parts that make it a shoot-'em-up or a word-processor, it leaves the actual details of getting data in and out of the micro to the operating system.

Theoretically, then once you have got a CP/M system you can run any

(continued on page 31)

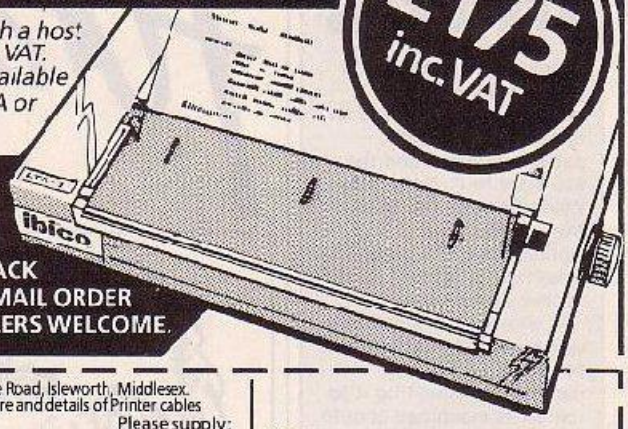
UNBEATABLE VALUE

ibico LTR-1 LETTER QUALITY PRINTER

£175 inc. VAT

A compact (12" x 2½" x 8"), letter quality printer from Ibico with a host of outstanding features at the unbelievable price of £175.00 inc. VAT.

Plugs straight into most computers, with optional interface available for Commodore 64 and Sinclair Spectrum. Compatible with BBC A or B and any computer with parallel interface.



- Prints 12 characters per second Elite type (12 characters per inch)
- Bi-directional printing • Logic seeking • Plain paper – uses your letterheading • Up to A4 size paper
- Instant change ink roller
- 96 characters, full UK ASCII code
- 80 columns • Separate power switch • On/off pilot lamp

FULL 12 MONTHS PARTS & LABOUR GUARANTEE. FULL 21-DAY MONEY BACK GUARANTEE FOR MAIL ORDER CUSTOMERS. CALLERS WELCOME.

ibico

IBICO LIMITED, 181 SPRING GROVE ROAD, ISLEWORTH, MIDDLESEX
TEL: 01-568 2379 Telex: 934364

To: Ibico Ltd., 181 Spring Grove Road, Isleworth, Middlesex.
Please send Ibico LTR-1 literature and details of Printer cables and interfaces.

	Please supply:
.... Ibico LTR-1 letter quality printer	£175.00
.... Printer cable for BBC A or B	£9.95
.... Interface for Commodore 64	£25.95
.... Interface for Sinclair Spectrum	£39.95

I enclose a cheque/P.O. for £.....
(Plus £4.50 for postage and packing)
Please debit my Access/Barclaycard Card: Expiry date .....
No: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
or telephone your credit card order
ALL PRICES INCLUDE VAT

Name: .....
Address: .....
.....
.....
..... Post Code .....
Tel. No.: .....

POOLSWINNER

THE ULTIMATE POOLS PREDICTION PROGRAM

boxed, with detailed instruction booklet

- **MASSIVE DATABASE** Poolswinner is a sophisticated Pools prediction aid. It comes complete with the largest database available – 22000 matches over 10 years. The database updates automatically as results come in.
- **PREDICTS** Not just SCOREDRAWS, but AWAYS, HOMES and NO SCORES.
- **SUCCESSFUL** SELEC guarantee that Poolswinner performs significantly better than chance.
- **ADAPTABLE** Probabilities are given on every fixture – choose as many selections as you need for your bet. The precise prediction formula can be set by the user – you can develop and test your own unique method.
- **SIMPLE DATA ENTRY** All English and Scottish team names are in the program. Simply type in the reference numbers from the screen. Or use FIXGEN to produce fixture list automatically (see below)
- **DISC/MICRODRIVE COMPATIBLE** All versions (except Apple and IBM) are supplied on tape, with simple instructions for conversion to disc/microdrive operation.

(This seasons results are supplied with the package so that predictions can start immediately.)

AVAILABLE FOR Spectrum (48K), Commodore 64, VIC 20 (+16K), AMSTRAD CPC 464, BBC B, Atari (48K), ZX81 (16K), Dragon, Apple II, IBM pc

PRICE £15.00 (all inclusive)

NEW

FIXGEN 84/5 AT LAST: No more struggling for hours to get the fixture list into the computer. FIXGEN has been programmed with all English and Scottish fixtures for 1984/5. Simply type in the date, and the full fixture list is generated in seconds. Fully compatible with Poolswinner

POOLSWINNER with FIXGEN £15.50 (all inclusive)
Fixgen alone £5.50

COURSEWINNER V3
THE PUNTERS COMPUTER PROGRAM

Coursewinner is designed to allow you to develop and test your own unique winning system. Using information from daily newspapers or 'Sporting Life', the most important factors can be input and analysed. The program is supplied with a database detailing best trainers and jockeys, and effect of the draw for all British courses. (Flat & National Hunt.)

AVAILABLE FOR Spectrum (48K), Commodore 64, BBC (B), Dragon, Atari (48K), Apple II

PRICE £12.50 (all inclusive)

AVAILABLE (RETURN OF POST) FROM...

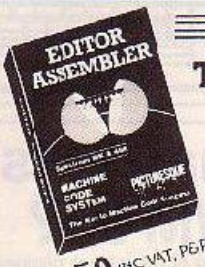
VISA — phone 24 hrs

selec SOFTWARE

Access — phone 24 hrs

37 COUNCILLOR LANE, CHEADLE, CHESHIRE. ☎ 061-428 7425

SPECTRUM



£8.50 INC VAT, P&P

£7.50 INC VAT, P&P

THE MACHINE CODE SYSTEM

- *"... one of the all too few jewels of Spectrum programming ... deserves a place in every serious programmer's library"* (Simon Springett—Popular Computing Weekly—June 1984)
- *"... the whole package is very friendly and easy to use ... can be highly recommended for those who are just about to start programming in Machine Code."* (Phil Holliday—Your Computer —May 1983)
- Fully compatible with MICRODRIVES/NETWORK/RS232 (with Interface 1) and most popular Centronics interfaces for 80 col. printout.

AMSTRAD

THE MACHINE CODE SYSTEM

- Both programs in one package
- Many NEW FEATURES
- Compatible with CASSETTE and DISC

AVAILABLE SHORTLY

- Send S.A.E. for fully detailed leaflet
- Available from many computer shops, or by FAST mail order by sending a cheque/P.O. to:—

PICTURESQUE PICTURESQUE PICTURESQUE PICTURESQUE

Dept YC, Picturesque, 6 Corkscrew Hill, West Wickham, Kent BR4 9BD

(continued from page 29)

of this software straightaway. As ever, though, life is not quite that simple. CP/M was first developed on the now almost extinct 8 in. discs. Later the standard 5.25 in. floppies were used. Now of course, we have 3.5 in. and 3 in. discs. Obviously you cannot run programs from the wrong-sized discs. But you also have to check that the format of the discs are the same. This can vary from machine to machine, even if they all run CP/M.

You normally boot, that is load up, CP/M from a disc. As the drive whirrs, the operating system program is being loaded into the main working memory of the micro, the Ram — random access memory. Booting — short for bootstrapping — requires some very simple program already in the micro to carry out this first operation. It is only after CP/M itself has been loaded that it can be used for more complex operations. This processing is called bootstrapping by analogy with someone pulling him or herself up by their own bootstraps.

CP/M signals that it is ready to accept your commands by means of the simple prompt a>.

The a refers to the disc drive you are currently using. If you have a second drive it would be called b, and so on.

There is a certain class of commands that are always available, and can be run immediately. A second class, called rather grandly "transients", have to be pulled in off the CP/M master disc to Ram before they can be run.

One of the most useful of the first class is DIR. Entering this command produces a directory of all the files on the current disc. You can copy files from disc to disc using copy, which is a transient command, and has to be loaded each time you wish to use it. This cannot, however, be used to copy the CP/M program itself. This has to be located right at the outside of a disc, and requires a special command SYSGEN, short for System Generator, another transient.

BEGINNERS *first bytes*

CP/M is mainly used with micros based on the Z-80 processor. Popular machines which are built around this chip include the Sinclair Spectrum and the MSX machines. As yet, however, these do not run under CP/M.

The Amstrad, which also uses a Z-80, does plan to offer CP/M when its disc drive appears. For other machines you normally have to buy an add-on which contains a Z-80 as a second processor running in parallel with the main chip. This is the technique used with the BBC micro and its Z-80 second processor unit.

As well as offering CP/M for more advanced 16-bit machines, Digital Research has also produced something called Concurrent CP/M. As its name suggests, this allows you to run several programs under CP/M concurrently, that is at the same time. Obviously, you need much more internal memory for this to hold all the programs simultaneously.

Even if it is unlikely therefore to filter down to the cheapest home micros, it is still an exciting development, and shows that there is life in CP/M yet.

Recording, storing and retrieving program data

THE VERY EARLIEST computers had programs laboriously entered by hand, machine code bit by machine code bit. The program was stored simply by existing physically as a series of small pegs inserted in holes on a board.

Later, technology progressed to allow streams of bits to be held in what was called a delay line — which did exactly that. A long tube was filled with fluid, and crystal oscillators and receivers used to send pulses along its length. An amplifier could keep a set of digits flowing around the tube for later use. Unfortunately, when you switched that power off, the information was lost. In this respect, these early storage devices were rather like the modern day Ram that dies when the micro is turned off.

True storage of programs began with the punched cards and streams of paper tape. Series of holes in them were read, first mechanically, and later optically, to produce corresponding electrical digits — a binary 1 for a hole, and a binary 0 for no hole. Ultimately magnetic media were developed, that allowed much higher storage densities and far swifter retrieval times.

The commonest form of data storage found in home micros is the audio cassette tape. Programs are simply converted into a series of audio signals that can be recorded onto the magnetic tape like any other noise. A beep is used to represent a binary 1 and the absence of a beep a binary 0.

When a program is loaded from a tape a similar process of translation is used to convert these audio signals back a series of electrical impulses which the micro can deal with.

There are obvious problems with this technique. First, the audio cassette is hardly a high-precision piece of equipment. Tiny faults that would be unnoticeable in audio playbacks could cause changes in single bits that would be fatal in a program.

The medium is also slow. Ordinary cassette recorders just cannot handle very fast changes between beep and non-beep.

Finally, and in some ways most inconveniently, to find a particular item on a tape you may have to run through nearly all of it. Similarly, you cannot go back to a particular spot without rewinding the whole tape. The Microdrives from Sinclair try to get round this by using a continuous loop of tape, rather like the old tape cartridge.

This type of medium is called sequential. Because you must go through the information stored in it in sequence. You cannot jump from one part to another. The latter type are called random access, and are both faster and generally more expensive than sequential systems.

The most familiar type of random access storage is Ram, which gets its name from random access memory. But like the delay lines, it is volatile — that is, its contents are lost as soon as you switch off the machine. However, the floppy disc is also random access, and retains its data.

Floppy discs use the same basic kind of recording technology found in audio cassettes, but instead of having a long thin strip they spread the magnetic coating over the surface of a plastic disc. The disc rotates at high speed — typically 300 rpm — underneath the reading and writing head of the unit. This is very similar to the head of a cassette deck.

But the high speed of rotation, and the precision tooling which allow the head to touch lightly the disc's surface mean that about 10 times as much information can be stored on a typical disc. It is also possible to up

and download programs from it very much faster.

The discs are divided up into concentric tracks, and the tracks into sectors. These tracks are not physically visible on a record, but are determined by the process of formatting.

Before using discs, you normally have to use a formatting program which places small magnetic markers on its surface setting out the possible positions for data to be stored. Most discs nowadays are soft-sectored in this way, though a few are hard-sectored: they have small physically marks that divide up the surface into regions.

Many different manufacturers lay down the marks on their discs in different ways. This means that although the micro could theoretically run a program written in say Basic, it might not be able to read from the disc because the formats are different. Another factor to be considered in this area of compatibility is whether a disc is single or double sided, and what the density is.

These are the new 3.5in. floppies. Older versions were 5.25in. and before that even 8in. Even though the physical size has come down this dramatically, capacities for floppies are well up into the Megabyte region.

There is a more expensive version of floppies that is just beginning to filter down to the home computer market. This is the hard disc. Whereas floppies allow you to remove and replace the disc system, which means that the whole design must be that much more robust, hard disc systems are completely enclosed in airtight containers. Far higher rotation speeds can be employed, allowing faster access and much higher densities. Hard discs — or Winchesters as they are sometimes known — can store 100 Megabytes and over.

Looking into the future, there is a technology just beginning to come through which promises even more fantastic storage capacities than those of hard discs. This is the optical disc.

Tiny pits are burnt into a plastic disc by a laser beam. This same beam can be used to read them: a pit represents a binary 1, and the absence of a pit a 0. Systems have been designed that can store about 1 Gigabyte of data — that is 1000 Megabytes — on a 12in. disc.

THOUGHTS & CROSSES

37 MARKET STREET, HECKMONDWIKE, WEST YORKS.

Telephone 0924-402337

Access Visa order 0924-409753

ALL PRICES INCLUDE VAT AND DELIVERY

SPECTRUM

Title	Company	RRP	Our price
All or Nothing	Abbex	£5.95	£5.20
Krakatoa	Abbex	£5.95	£5.35
Golf	Abbex	£6.95	£6.20
Designers Point	Activision	£9.95	£8.95
Enduro	Activision	£8.95	£8.10
Ghostbusters	Activision	£8.95	£8.10
Hacker	Activision	£8.95	£8.10
Hero Red	Activision	£7.95	£7.10
Space Shuttle	Activision	£9.95	£8.95
Zenji	Activision	£8.95	£8.10
Football Manager	Addictive Games	£6.95	£6.20
Incredi Je Hulk	Adventure	£9.95	£8.95
Sorcerer of Claxmorgue	Adventure	£9.95	£8.95
Spellbound	Adventure	£9.95	£8.95
Son of Blagger	Alligata	£5.95	£5.35
Enormous Tunnel	Arrow	£9.95	£8.95
Five Little Ducks	Arrow	£9.95	£8.95
Gold Mines	Arrow	£9.95	£8.95
Mr Mick Day	Arrow	£9.95	£8.95
Nine Carrots Gone	Arrow	£9.95	£8.95
Red Riding Hood	Arrow	£9.95	£8.95
The Magic Shop	Arrow	£9.95	£8.95
Chess 1	Artic	£9.95	£8.95
Chess Tutor	Artic	£6.95	£6.25
Eye of Bian	Artic	£6.95	£6.25
Galaxians	Artic	£5.95	£5.35
Golden Apple	Artic	£6.95	£6.25
Invaders	Artic	£4.95	£4.50
Mr Wimpy Lonely Lucky	Artic	£6.95	£6.25
Ship o' Doom	Artic	£6.95	£6.25
Snooker	Artic	£6.95	£6.25
World Top Soccer	Artic	£6.95	£6.25
Fall of Rome	Asp	£6.95	£6.20
Charlie Fop	A.I.F.	£6.95	£6.20
New Orleans Attack	A.I.F.	£6.95	£6.20
Beta Basic	Betasoft	£11.00	£9.95
Doomsacks Revenge	Beyond	£9.95	£8.95
Lords of Midnight	Beyond	£9.95	£8.95
Psytron	Beyond	£7.95	£7.15
Attack	Bug-Byte	£6.95	£6.25
Birds and Bees	Bug-Byte	£6.95	£6.25
Kung fu	Bug-Byte	£6.95	£6.25
Star Trader	Bug-Byte	£6.95	£6.25
The Castle	Bug-Byte	£6.95	£6.25
Tunnel	Bug-Byte	£6.95	£6.25
Twin Kingdom Valley	Bug-Byte	£7.95	£7.15
Masterile	Campbell Systems	£16.00	£14.00
Masterile & MK Point	Campbell Systems	£19.95	£18.00
The Worm of Magra	Carnell Software	£12.95	£11.95
Pool	CDS	£5.95	£5.35
Steve Davis Snooker	CDS	£7.95	£7.15
Beer Course	Chestnutsoft	£6.95	£6.25
Paddington Disappearing Ink	Collins	£7.95	£7.15
Paddington Early Visit	Collins	£7.95	£7.15
Paddington Problem Picture	Collins	£7.95	£7.15
Paddington shopping was up	Collins	£7.95	£7.15
Volcanic	Computer Magic	£7.95	£7.15
Adventureer	CP Software	£9.95	£8.95
Backgammon	CP Software	£5.95	£5.35
Bridge Player 2	CP Software	£9.95	£8.95
Bridge Tutor Advanced	CP Software	£6.95	£6.25
Bridge Tutor Beginner	CP Software	£5.95	£5.35
Cribbage Basic	CP Software	£5.95	£5.35
Floating Point Tutor	CP Software	£14.95	£13.95
Pinball Wizard	CP Software	£6.95	£6.25
Snail Logic	CP Software	£5.95	£5.35
Superchess 3.0	CP Software	£8.95	£8.05
Superchess 3.5	CP Software	£8.95	£8.05
Superpoke II	CP Software	£6.95	£6.25
ZX Assembler	CP Software	£6.95	£6.25
Blockbreak	Creative Sparks	£6.95	£6.25
Danger Mouse Back Forest	Creative Sparks	£6.95	£6.25
Danger Mouse Double Trouble	Creative Sparks	£6.95	£6.25
Dette Way	Creative Sparks	£6.95	£6.25
Stagecoach	Creative Sparks	£6.95	£6.25
Harry Tuna	CRL	£6.95	£6.25
Filth	CRL	£5.95	£5.35
Great Detective	CRL	£5.95	£5.35
Handicap Golf	CRL	£5.95	£5.35
Highway Code	CRL	£5.95	£5.35
Magic Foundation	CRL	£5.95	£5.35
Stargate Secrets	CRL	£5.95	£5.35
Tomahawk	CRL	£6.95	£6.25
Test Match	CRL	£5.95	£5.35
War of the Worlds	CRL	£7.95	£7.15
Dungeon Master	Crystal	£7.95	£6.75
Hole of Thing	Crystal	£7.95	£6.75
Hermits Revenge	Crystal	£7.95	£6.75
The Island	Crystal	£7.95	£6.95
Contraflow	D-Tech	£6.95	£6.95
Highway Code	Dolphin	£5.95	£5.35
Micro Olympics	Database	£5.95	£5.35
The Magic Sword	Database	£7.95	£7.15
Dark Star	Design	£7.95	£7.15
DFM Database	Design	£14.95	£13.50
Fighter Pilot	Digital Integration	£7.95	£7.15
Tomahawk	Digital Integration	£9.95	£8.95
Deflektor	DK'Tronics	£4.95	£4.50
Flash Machine	DK'Tronics	£4.95	£4.50
Galactibeans	DK'Tronics	£4.95	£4.50
Golf	DK'Tronics	£4.95	£4.50
Invaders	DK'Tronics	£4.95	£4.50
Maulers	DK'Tronics	£6.95	£6.25
Meteoroids	DK'Tronics	£4.95	£4.50
Nightmare	DK'Tronics	£4.95	£4.50
Personal Finance	DK'Tronics	£6.95	£6.25
Speed Duel	DK'Tronics	£5.95	£5.35
The Ruins of Zendos	Dorcas	£7.95	£7.15
Eureka	Domark	£14.95	£13.50
Oracle Cave	Doric	£7.95	£7.15
Dungeon Builder	Dream	£6.95	£6.95
Quest of the Holy Grail	Dream	£6.95	£6.95
Cornet Lyne	Durell	£6.95	£6.05
Harrier Attack	Durell	£5.95	£5.35
Jungle Trouble	Durell	£5.95	£5.35
Scuba Dive	Durell	£5.95	£5.35
Aircraft	Elite	£6.95	£6.25
Fall Guy	Elite	£6.95	£6.25
Kokotoni Wilf	Elite	£6.95	£6.25
Backpackers	Fantasy	£7.50	£6.75
Really A Top Snooker	Fantasy	£6.50	£4.95
Doomsday Castle	Fantasy	£6.50	£5.85
Theatre of	Fantasy	£7.50	£6.75
The Pyramid	Fantasy	£6.50	£4.95
Beany	Firebird	£2.50	£2.50
Viking Raiders	Firebird	£2.50	£2.50
Wiz Biscuit	Firebird	£2.50	£2.50
Ballooning	Five Ways	£8.95	£8.95
Punchinello Pete	Five Ways	£8.95	£8.95
Sneak Thief	Five Ways	£8.95	£8.95
Bobinthoust	Front Runner	£7.95	£7.15
Boulder Dash	Front Runner	£7.95	£7.15
Ad astra	Gargoyle	£7.95	£6.95
Tir Na Nog	Gargoyle	£8.95	£8.95
The Eustrians	Gilsoft	£14.95	£13.50
The Quill	Gilsoft	£14.95	£13.50
City of Ilnastish	Golden	£9.95	£9.95
Money Mania	Grandslam	£5.95	£5.35
Percival the Potty Pigeon	Grandslam	£6.95	£6.25
Wizbiard	Griffin	£9.95	£8.95
Air Traffic Control	Hewson Cons.	£7.95	£7.15
Avalon	Hewson Cons.	£7.95	£7.15
Fantasia Diamond	Hewson Cons.	£7.95	£7.15
Marauder	Hewson Cons.	£7.95	£7.15
Mare Chess	Hewson Cons.	£5.95	£5.35
Night Driver	Hewson Cons.	£5.95	£5.35
Nightflite II	Hewson Cons.	£7.95	£6.95
3D Lunar Attack	Hewson Cons.	£7.95	£7.15
3D Strato Attack	Hewson Cons.	£7.95	£7.15
3D Space Wars	Hewson Cons.	£7.95	£6.95
Dev-Pac 3	Hisoft	£14.00	£13.50
Pascal	Hisoft	£25.00	£23.50
ULowrie	Hisoft	£9.95	£8.50
Alchemist	Imagine	£6.50	£4.95
Arcadia	Imagine	£6.50	£4.95
Jumping Jack	Imagine	£5.50	£4.95
Pedro	Imagine	£5.50	£4.50
Stonkers	Imagine	£5.50	£4.95
Zip Zap	Imagine	£5.50	£4.95
Zoom	Imagine	£5.50	£4.95
Fear Master	Incentive	£5.50	£5.35
Millionaire	Incentive	£5.50	£4.95
Mountains of Ket	Incentive	£5.50	£4.95
Spiral	Incentive	£5.50	£4.95
Temple of Vran	Incentive	£5.50	£4.95
TIME	Incentive	£5.50	£4.95
Jewels of Babylon	Interceptor	£5.50	£4.95
Tau	Interceptor	£5.50	£4.95
Multi Fire	ISP	£9.95	£8.95
Scoop	ISP	£17.95	£16.20
Screen Machine	ISP	£9.95	£8.95
Pacmania Eclipse	Kems	£14.95	£13.50
Laser League	Kems	£14.95	£13.50
Stock Control	Kems	£14.95	£13.50
Scrabble Tutor A	Kosmos	£9.95	£8.95
Spanish Tutor B	Kosmos	£9.95	£8.95
The Great Space Race	Legend	£14.95	£13.50
Valhalla	Legend	£14.95	£13.50
Adventure Quest	Level 9	£9.00	£8.00
Dunbarg Adventure	Level 9	£9.00	£8.00
Dungeon Adventure	Level 9	£9.00	£8.00
Lords of Time	Level 9	£9.00	£8.00
Return to Eden	Level 9	£9.00	£8.00
Snowball	Level 9	£9.00	£8.00
Fire in the Water	Lone Wolf	£9.95	£8.95
Night from the Dark	Lone Wolf	£9.95	£8.95
ASC Liteoff	Longman	£7.95	£7.15
Countdown	Longman	£7.90	£7.10
Mathematics	Longman	£8.95	£8.10
Physics	Longman	£8.95	£8.10
Shaffle	Longman	£9.95	£8.95
Word of Wizard	Longman	£7.95	£7.15
Communicator	Lothlorien	£7.95	£7.15
Communicator 2	Lothlorien	£9.95	£9.25
Dreadnought's	Lothlorien	£7.95	£6.95
Johnny Reb	Lothlorien	£5.50	£4.95
Micro Mouse	Lothlorien	£5.95	£4.95
Power Attack	Lothlorien	£5.95	£5.25
Panic	Lothlorien	£6.95	£6.25
Red Baron	Lothlorien	£6.95	£5.25
Rubicon	Lothlorien	£6.95	£6.25
Space Operations	Lothlorien	£6.95	£5.35
Tyrant of Athens	Lothlorien	£5.50	£4.95
Bloodsucker	Macsen	£6.95	£6.25
Eddie Kidd's Jump Challenge	Martech	£6.95	£6.25
Phoenix	Megadroid	£5.50	£4.95
Abbadon Path	Melbourne House	£14.95	£13.50
Classic Adventure	Melbourne House	£9.95	£8.95
Hampstead	Melbourne House	£9.95	£8.95
Holmes	Melbourne House	£14.95	£13.50
Hurg	Melbourne House	£14.95	£13.50
Lancelot	Melbourne House	£9.95	£8.95
Melbourne Draw	Melbourne House	£9.95	£8.00
Mugsy	Melbourne House	£9.95	£8.95
Sherlock	Melbourne House	£14.95	£13.50
4D Tetris Quest	Melbourne House	£9.95	£8.95
Spread Sheet	Melbourne House	£9.95	£8.95
Brave Bluff	Micromega	£6.95	£6.25
Codename Mat	Micromega	£6.95	£6.25
Full Throttle	Micromega	£6.95	£6.25
Harvard Hedges	Micromega	£6.95	£6.25
Jasper	Micromega	£6.95	£6.25
Kamikaze	Micromega	£6.95	£6.25
Lunar Chess	Micromega	£6.95	£6.25
3D Death Chase	Micromega	£6.95	£6.25
Evolution	Microsphere	£6.95	£6.25
Omnicalc 2	Microsphere	£14.95	£13.50
Skool Daze	Microsphere	£6.95	£6.25
Sky Ranger	Microsphere	£5.95	£5.35
Wheelie	Microsphere	£5.95	£5.35
Air Traffic Control	Micro-Gen	£9.95	£8.95
Auto Mania	Micro-Gen	£6.95	£6.25
Nightshade	Micro-Gen	£6.95	£6.25
The Wizard's Cauldron	Micro-Gen	£6.95	£6.25
American Football	Mind Games	£9.95	£8.95
Sweet the Cat	Microsoft	£8.95	
Test Match with the McMen	Microsoft	£8.95	£8.35
Quick Thinking	Microsoft	£6.95	£6.25
Xenophon	Mitech	£5.95	£5.35
Out of the Shadows	Mosaic	£7.95	£7.15
Set The Mole Before He Gets You	Modular Resources	£6.45	£7.35
Ink The Viking	Mosaic	£9.95	£8.95
Machine Code Tutor	New Generation	£14.95	£13.30
Freehand	New Generation	£6.95	£6.35
Travel With Trashman	New Generation	£5.95	£5.35
Wind Games	Oasis	£14.95	£13.50
Spec Man Man	Oasis	£14.95	£13.50
White Lightning	Oasis	£14.95	£13.50
Armageddon	Ocean	£6.90	£6.30
Caveman	Ocean	£6.90	£6.30
Chinese Juggle	Ocean	£5.90	£5.30
Daley Thompson's Decathlon	Ocean	£6.90	£6.20
Jaikins Diike	Ocean	£5.90	£5.30
Mr Weems and the Bears	Ocean	£5.90	£5.30
Salamander	Ocean	£5.95	£5.35
Sorcery	Ocean	£5.90	£5.30
Song Smokes Back	Ocean	£6.90	£6.20
Watch Dog	Ocean	£7.95	£7.15
Moon Alert	Ocean	£5.90	£5.30
Mr Wimpy	Ocean	£5.90	£5.30
Yogo	Ocean	£6.90	£6.30
Royal Birkdale	Ocean	£6.90	£6.30
Tennis & Jacket	Penguin	£5.95	£5.35
The Force	Phase	£9.95	£8.95
Sabre & Assassin	Picturesque	£6.50	£7.35
Spectrum Mentor	Picturesque	£7.50	£6.75
Factory Breakout	Pyramid	£6.90	£4.95
Tantalus	Ultimate	£6.95	£7.35
Sixth Man Pilotes	Sixth Man Pilotes	£6.95	£7.40
Mission 1	Project Volcano	£7.95	£7.15
Kalimer	Prism	£6.95	£5.35
Hunter Killer	Proton	£7.95	£7.15
Hopper	PSS	£5.95	£5.35
Air Blitz	PSS	£5.95	£5.35
Moonbeam	PSS	£9.95	£8.95
Acupuncture	Quicksilva	£6.95	£4.95
Sagittarius	Quicksilva	£6.95	£6.25
Dragonslayer	Quicksilva	£6.95	£6.25
Snot	Quicksilva	£6.95	£6.25
James Designer	Quicksilva	£14.95	£13.50
Winter Storm	Quicksilva	£6.95	£6.25
The Snowman	Quicksilva	£6.95	£5.25
Wind Powerup	Quicksilva	£6.95	£5.25
Zombie Zombie	Quicksilva	£6.95	£6.25
3D Ant Attack	Quicksilva	£6.95	£6.25
Frogger	Quicksilva	£5.95	£5.35
3D Stonkiee	Realtime	£5.95	£5.35
3D Tank Duel	Realtime	£5.95	£5.35
Apocalypse	Red Shift	£9.95	£8.95
City of Death	Red Shift	£9.95	£8.95
The Tripods	Red Shift	£9.95	£8.95
Inferno	Richard Shepherd	£6.50	£5.85
Invisible Island	Richard Shepherd	£6.50	£5.85
Ship of the Line	Richard Shepherd	£6.50	£5.85
Superspy	Richard Shepherd	£6.50	£5.85
Urban Upstairs	Richard Shepherd	£6.50	£5.85
Trans	S.R.S.	£7.95	£7.15
Armageddon	Silversoft	£5.95	£4.50
Brain Damage	Silversoft	£5.95	£4.50
Exterminator	Silversoft	£5.95	£4.50
Ground Attack	Silversoft	£5.95	£4.50
Mission Impossible	Silversoft	£5.95	£4.50
Paradise	Silversoft	£5.95	£4.50
Robot Riot	Silversoft	£5.95	£4.50
Twin Spade	Silversoft	£5.95	£4.50
Super Hunt	Silversoft	£5.95	£5.35
Horse Things Happen At Sea	Silversoft	£5.95	£5.35
Backgammon	Sinclair	£5.95	£5.25
Backgammon	Sinclair	£5.95	£5.25
Cribbage Games	Sinclair	£7.95	£7.15
Castle Quellerie	Sinclair	£7.95	£7.15
Chequered Flag	Sinclair	£7.95	£7.15
Chess	Sinclair	£7.95	£7.15
Chess Tutor	Sinclair	£9.95	£8.95
Club Record Computer	Sinclair	£6.95	£6.25
Collectors Pack	Sinclair	£6.95	£6.25
Entre Tanks	Sinclair	£6.95	£5.25
Early Punctuation	Sinclair	£7.95	£7.15
English Literature	Sinclair	£6.95	£6.25
Espionage Island	Sinclair	£6.95	£6.25
Flight Simulation	Sinclair	£7.95	£7.15
Glow	Sinclair	£9.95	£8.95
Hunter	Sinclair	£6.95	£6.25
Human Chess Game	Sinclair	£6.95	£6.25
Inca Curse	Sinclair	£5.95	£5.25
Inventoria	Sinclair	£6.95	£6.25
Learn to Read	Sinclair	£9.95	£8.95
Learn to Read 1	Sinclair	£9.95	£8.95
Learn to Read 3	Sinclair	£9.95	£8.95
Learn to Read 4	Sinclair	£9.95	£8.95
Learn to Read 5	Sinclair	£9.95	£8.95
Make A Chip	Sinclair	£9.95	£8.95
Match Point	Sinclair	£7.95	£7.15
Mind Probe	Sinclair	£24.95	£22.50
Monitor/Disassembler	Sinclair	£12.95	£11.65
Musicmaster	Sinclair	£9.95	£8.95
Planet of Death	Sinclair	£6.95	£6.25
Pool Utilities	Sinclair	£5.95	£4.95
Scrabble	Sinclair	£15.95	£14.35
Ship of Doom	Sinclair	£6.95	£6.25
Small Business Accounts	Sinclair	£12.95	£11.65
Speech Works	Sinclair	£7.95	£7.15
Stop The Express	Sinclair	£6.95	£6.25
Survival	Sinclair	£9.95	£8.95
The Arcatronic	Sinclair	£7.95	£7.15
Vu File	Sinclair	£6.95	£6.05
Vu Calc	Sinclair	£6.95	£6.05
Vu 3D	Sinclair	£9.95	£8.95
Zeus Assembler	Sinclair	£12.95	£11.65
ZX Forth	Sinclair	£14.95	£13.50
American Football	Software	£2.99	£2.99
Fighter Pilot	Software	£2.99	£2.99
Dalkeith 1	Software	£2.99	£2.99
Turtle Tenowarz	Software	£2.99	£2.99
Astronut	Software Projects	£5.95	£5.35
Lode Runner	Software Projects	£5.95	£5.35
Manic Miner	Software Projects	£5.95	£5.35
Jet Set Willy	Software Projects	£5.95	£5.35
Leaving Will Leave	Software Projects	£9.95	£8.95
Tribble Trouble	Software Projects	£5.95	£5.35
Tascorp	Tasman	£9.50	£8.90
Tasmerge	Tasman	£10.50	£9.80
Tasword	Tasman	£9.50	£8.90
Tasword	Tasman	£9.50	£8.90
Tasword Two	Tasman	£13.00	£12.50
Starbike	The Edge	£7.95	£7.15
Giant's Revenge	Thor	£6.95	£6.95
Jack & The Beanstalk	Thor	£5.95	£5.35
Megapede	Thor	£5.95	£5.35
The Image Twat Jack Built	Thor	£5.95	£5.35
Twilight Zone	Thor	£5.95	£5.35
Alle Alle	Ultimate	£5.50	£4.95
Cookie	Ultimate	£5.50	£4.95
Jetpac	Ultimate	£5.50	£4.95
Knight Lore	Ultimate	£9.95	£8.95
Lunar Jetman	Ultimate	£5.50	£4.95
Pssst	Ultimate	£5.50	£4.95
Sabre Wulf	Ultimate	£9.95	£8.95
Tranz Am	Ultimate	£5.50	£4.95
Underwurlde	Ultimate	£9.95	£8.95
Beach Head	US Gold	£7.95	£7.15
Blue Max	US Gold	£7.95	£7.15
Racing Manager	Virgin Games	£5.95	£5.35
Strangelove	Virgin Games	£5.95	£5.35
The Island	Virgin Games	£6.95	£6.25
Moon Buggy	Visions	£6.95	£6.25
Crooker	Visions	£6.95	£6.05
1984	Visions	£6.95	£6.25
Android Two	Vortex	£6.95	£5.35
Cyclone	Vortex	£6.95	£6.25
TLL	Vortex	£5.95	£5.35
Nine Tiles	Wilmot	£6.95	£6.35
Howler	Wyvern	£6.95	£4.95

COMMODORE

Title	Company	RRP	Our price
Pitfall II	Abbex	£7.95	£6.75
Decathlon	Activision	£9.95	£8.95
Gaza Hellion	Activision	£9.95	£8.95
Great Russian	Activision	£10.95	£9.95
H.E.R.O.	Activision	£9.95	£8.95
Pitfall	Activision	£9.95	£8.95
Pitfall II	Activision	£9.95	£8.95
River Raid	Activision	£9.95	£8.95
Tennis	Activision	£9.95	£8.95
Zenji	Activision	£9.95	£8.95
Football Manager	Addictive Games	£7.95	£7.15
Quasimodo (The Hulk)	Adventure Int.	£9.95	£8.95
Sorcerer of Claxmorgue Castle	Adventure Int.	£9.95	£8.95
Voodoo Castle	Adventure Int.	£9.95	£8.95
Blagger	Alligata	£7.95	£7.15
Chainbuster	Alligata	£8.95	£8.05
Contact Sidjim	Alligata	£9.95	£8.95
Damned in Distance	Alligata	£7.95	£7.15
Killer Worm	Alligata	£7.95	£7.15
Loco	Alligata	£7.95	£7.15
Rocket Raider	Alligata	£7.95	£7.15
Son of Blagger	Alligata	£7.95	£7.15
Battle Through Time	Aligrip	£7.95	£7.15
Cosmic Commando	Aligrip	£6.95	£6.35
Frog Run	Aligrip	£5.95	£5.35
Flight Path 737	Aligrip	£7.95	£7.15
Galaxy	Aligrip	£7.95	£7.15
Heavyset	Aligrip	£7.95	£7.15
Heroes of Karn	Aligrip	£7.95	£7.15
Kong	Aligrip	£7.95	£7.15
Lost Angels	Aligrip	£7.95	£7.15
PC Fuzz	Aligrip	£7.95	£7.15
Space Pilot	Aligrip	£7.95	£7.15
Tom Thumb	Aligrip	£7.95	£7.15
Zodiac	Aligrip	£7.95	£7.15
Island Guy	Anirog	£6.95	£6.25
The fall of Rome	Asp	£6.95	£6.20
Alkemi Video Land	Audiogenic	£8.95	£8.05
Grand Master	Audiogenic	£17.95	£16.00
Magic Stone	Audiogenic	£8.95	£8.05
Magic Dragons	Audiogenic Sdk	£34.95	£26.95
Doctor Mania	Audiogenic	£8.95	£8.05
Swift Screenplay	Audiogenic Sdk	£39.95	£26.95
Time Traveller	Audiogenic	£8.95	£8.05
System 15000	AVS	£9.95	£8.95
Chicken Egg	A & F	£7.95	£7.15
Ankh	Beyond	£8.95	£8.05
Aztec	Beyond	£8.95	£8.05
Mi-Raxx	Beyond	£8.95	£8.05
Sphere of Dev	Beyond	£8.95	£8.05
PSI Warrior	Beyond	£8.95	£8.05
Psytron	Beyond	£8.95	£8.05
Exterminator	Bubble Bus	£6.95	£6.35
Wizard's Revenge	Bubble Bus	£6.95	£6.35
Adventurer	Bubble Bus	£6.95	£6.30
Banking Buggies	Bubble Bus	£6.95	£6.30
Hustle	Bubble Bus	£6.95	£6.30
Kick Off	Bubble Bus	£6.95	£6.30
Label Printer	Bubble Bus	£6.95	£6.30
Tester Printer	Bubble Bus	£6.95	£6.30
Quazer	Bubble Bus	£6.95	£6.30
Wall Walker	Bubble Bus	£6.95	£6.30
Twin Kingdom Valley	Bug Byte	£9.50	£8.90
Colossus Chess	CDS	£9.95	£8.95
Colossus Chess	CDS disk	£12.95	£11.65

Range of programs available for MTX, BBC, Electron and Amstrad

Please order stating (1) Programs required; (2) Computer; (3) Amount enclosed; (4) Name & Address.
All prices include, packing & VAT. Overseas orders welcome.

If you have anything of interest to tell us about your computer club why not contact us on 01-661 3144.

Local news

Grüningen

The newly-founded Swiss Sinclair User Club seeks members. They are keen to establish links with similar clubs in Germany and Austria. Main language of the club, apart from Basic, looks like German, but since it's Switzerland, all you French, Italian and Romanesch speakers should write to Sinclair User Club Schweiz, Postfach 16, CH-8627 Grüningen. Tel: 01 241 19 08 or 01 948 00 25.

Blackburn

Blackburn Computer Club meets on alternate Mondays at the Fernhurst Hotel, Bolton Road, Blackburn, at 7.30 in the evening. All machines welcome. Membership is about £5 for adults and £3 for juniors. For more details contact John Schofield on 0254 28 27.

Lincoln

Lincoln Computer Club is part of Lincolnshire Microprocessor Society and has some interesting evenings billed for the future including "Music and Computers" and a visit to the Computer Control Unit at the NatWest Bank. The club meets at the Cardinal's Hat, 268 High Street, Lincoln. More details from Douglas Griffiths, 659 Newark Road, Swallowbeck, Lincoln LN6 8SA. Telephone: 0522 680578.

Colwyn

Colwyn Computer Club meets at the Greens Hotel, Colwyn Bay. Contact D Bevan, c/o Abergele Road, Colwyn Bay, Clwyd LL29 7PA.

COMPUTER *club*

Paul Bond discovers one of the great grandaddies of computer clubs with modern ideas in Harrow.

THE HARROW COMPUTER Group must surely be one of the great grandaddies of the fraternal programming phenomenon. It can claim to have started meeting informally in late 1968 — yes, 1968 — and was formally constituted in early 1969. Some of our younger readers may imagine that the biggest problem the original members had to contend with was dodging pterodactyls on the way back home — but the pioneering home computer of this time was the Nascom 1.

"Machines seem to go in phases here," opined one club member. "First there was the Nascom, then the Commodore PET, then the BBC. I don't know what'll be next". Many major computer industry figures almost certainly share this uncertainty.

Wednesday night — or at least the alternate Wednesday night — is robot night at Harrow, at least in theory. Bazyle Butcher, self-styled ex-chairman of the club, had brought along a prototype turtle-oid device that he was working on, and on previous evenings various types of robots had been known to make an appearance.

Mr Butcher was at pains to point out that while he himself is a microwave engineer, membership of the club is drawn from all walks of life. This was certainly evident on the night *Your Computer* attended the club. One member, a British Telecom manager, had acquired a 3BC to learn Basic. Other members included a gentleman who worked for a builder's firm and maintained that he used it for running the company golf club, a member of the Metropolitan police force, and a lady who displayed such a remarkable reluctance to reveal her name or occupation to the press that she must be assumed to work for some secret department of government. One would have thought we were going to make fun of her.

Some of the younger members of the club were engaged in a game entitled "BMX on the Moon", but criticism of games software for the BBC machine was not restrained — certain companies, like Aardvark Software, however, were considered to have produced some quality material.

Recent club lectures have included a talk on telesoftware by Bob Tidy, and a discussion of Commodore programming techniques led by Pete Calver of Supersoft. Doubtless this will attract members of the PET group, who currently meet in a member's house. The Harrow Computer Group has plans for a stand as usual at the London Festival of Computing to be held April 9-21. Inquiries about the Festival should be directed to 3TPR on 01-734 2907.

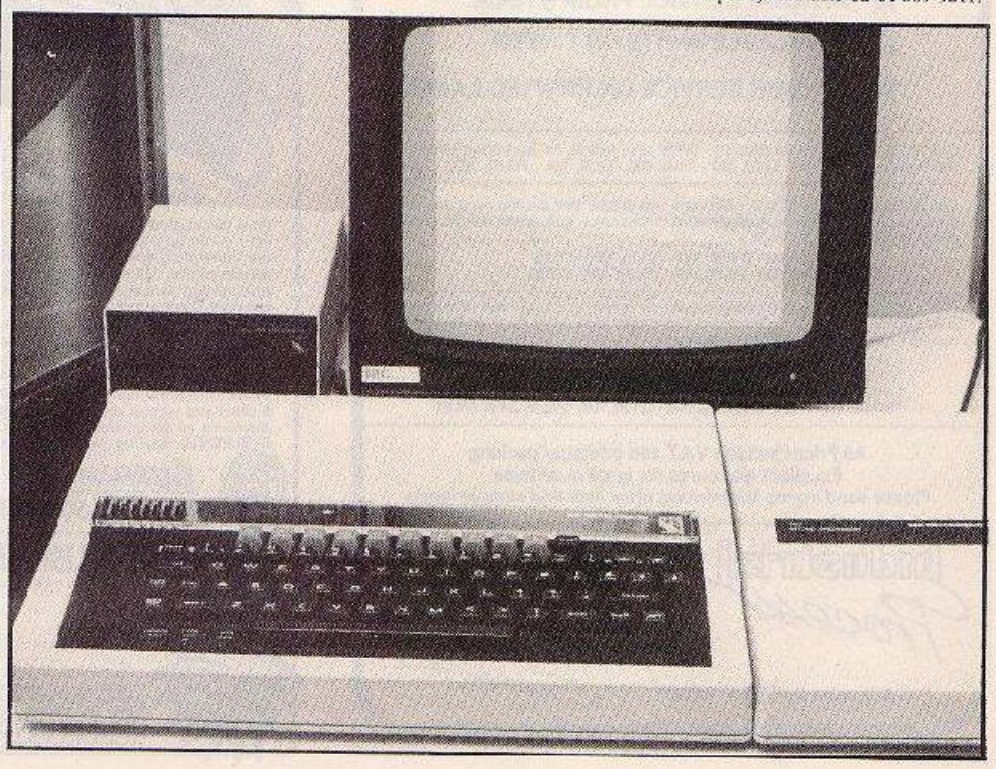
Apart from lectures, hardware evenings, and attendance at exhibitions, the club operates a members' library. This contains British and American magazines, technical books and also a Buzzbox modem.

The Harrow Computer Group is a member of the Association of London Computer Clubs — Bazyle Butcher is an ex-treasurer of the ALCC — as well as being affiliated to the Association of Computer Clubs national group.

Membership of the club also entitles you to visit Croydon Micro Club, the Independent Commodore Products User Group clubs, Sutton Library Club, North Kent Amateur Computer Club — and this is to name but a few.

HCG meets at 7.30 pm on Wednesdays in the Kenton Room at the Harrow Arts Centre, opposite the Alma Public House in Harrow Weald. Membership is £5 per year or you can visit for 50p a meeting. BBC users should contact E Londy on 01-907 7430, PET users should contact P Butson on 01-907 5355.

For information about main group meetings telephone N Merton on 01-204 9127 or A Diston on 01-904 2559. Club Secretary is Norman Campbell, reachable on 01-863 5241.



LOOK WHAT YOU MISSED IN BEEBUG VOLUME TWO

BBC MICRO
- USER SUPPORT -

● 10 ISSUES OF BEEBUG MAGAZINE MAILED FREE TO MEMBERS ● 30 EXCITING GAMES AND VISUAL PROGRAMS ● 43 SOFTWARE REVIEWS ● 33 HARDWARE REVIEWS ● 16 BOOK REVIEWS ● 150 HINTS AND TIPS ● 25 APPLICATION PROGRAMS ● SERIES OF ARTICLES FOR BEGINNERS ● MANY ADVANCED TECHNICAL ARTICLES ● NEWS AND PRODUCT INFORMATION ● PLUS SPECIAL OFFERS ● BIG DISCOUNTS ON A WIDE RANGE OF PRODUCTS ● EVENTS ● BRAIN TEASERS ● LOCAL CLUBS ● FULL MAGAZINE INDEX

A YEARS SUBSCRIPTION WOULD HAVE BOUGHT YOU ALL THIS

Figures based on the 10 issues of BEEBUG Volume 2.

BUT IT'S NOT TOO LATE TO JOIN FOR VOLUME THREE

BEEBUG PUBLICATIONS LTD. PO BOX 109, HIGH WYCOMBE, BUCKS

PLEASE ENROL ME FOR VOLUME 3 of BEEBUG AT £11.90 (10 ISSUES)

NAME .....

ADDRESS .....

..... AMOUNT ENCLOSED .....

BEEBUG HAS BEEN ESTABLISHED FOR TWO YEARS AND NOW HAS OVER 25,000 MEMBERS. IT OFFERS TOTAL USER SUPPORT TO ALL BBC MICRO USERS.

PLEASE MAKE CHEQUES MADE PAYABLE TO BEEBUG PUBLICATIONS LTD.
AND SEND TO:- DEPT 4 PO BOX 109, HIGH WYCOMBE, BUCKS.
(DISTRIBUTION AGENTS FOR BEEBUG)

Self Adhesive Cassette & Disk Labels

★ 24 HOUR SERVICE FROM STOCK
★ AVAILABLE WHITE OR TINTED
★ 48 HOUR SERVICE ON PRINTED LABELS

CASSETTE LABELS ON A4 SHEETS - White only, suitable for small-offset printing or photocopying: 100 labels - £3.50, 200 - £6.00, 300 - £8.25, 500 - £12.00, 1000 - £21.85

CASSETTE LABELS IN ROLLS - Complete with tractor feed backing paper for over-printing by computer printer. Available white or tinted blue, pink, green, orange, grey or yellow. Minimum order 500 labels.

WHITE: 500 - £14.66, 1000 - £20.70, 2000 - £31.05
TINTED: 500 - £16.90, 1000 - £24.15, 2000 - £37.95

DISK LABELS - Available in 127 & 95 mm width for conventional floppy disk (36mm deep), or 71 x 69mm for the MSX style compact floppy disk. These labels are all on tractor feed backing paper with a range of tints as above.

WHITE, 95mm: 500 - £12.75, 1000 - £17.75, 2000 - £20.56
TINTED, 95mm: 500 - £15.20, 1000 - £24.65, 2000 - £34.38
WHITE, 127mm & Compact disk: 500 - £16.66, 1000 £22.05, 2000 - £25.70
TINTED, 127mm & Compact disk: 500 - £21.35, 1000 - £31.05, 2000 - £43.65

All Prices include VAT and postage/packing
Excellent discounts for large quantities
Please send stamp for printing price lists and sample labels

Industrial Process

UNIT A4
SMEED-DEAN CENTRE
EUROLINK INDUSTRIAL ESTATE
SITTINGBOURNE
KENT ME10 3RN
Sittingbourne (0795) 28425

Self Adhesive Computer Labels — Superfast

FREE SOFTWARE FOR LIFE!

New Gold Star life membership of The Software Library is your key to a vast treasure trove of tapes costing up to £18 each. They are yours whenever you want them, three at a time... and a full week's rental won't ever cost you a penny in hire fees!

Only the original Software Library has the resources to make such an amazing offer—free software for life! Our ten megabyte computer ensures fast service; our illustrated, descriptive catalogue makes it fun to choose from over 80 top arcade games, 124 Adventures, simulations and other games, and over 120 great utilities and serious applications; 65% are for the Spectrum, the rest divided between Commodore 64 and ZX81. New releases are constantly being added.

Joining this money-saving scheme **should** cost you £24; as an introductory offer, you can join this month at **half price**— £12. From then on, you can take away three tapes from our shop whenever you wish; or if you order by post, all we ask is 30p post/packing per tape. The rental is perfectly free in either case.

What's more, you can sell your surplus software to other members (we have over 5,000!) and recoup the cost of membership in no time at all. We offer huge discounts on peripherals and tapes... and so much more. Phone us now on 0730 892732, quoting your Access number, or return the coupon without delay!

GUARANTEED to save you more than any other software library scheme!

SOFTWARE LIBRARY FARNHAM ROAD, LISS, HANTS GU33 6JU

Please enrol me at the introductory offer, and send my membership pack by return.

NAME ..... I enclose cheque/P.O. for £

ADDRESS .....

THE ORIGINAL SOFTWARE LIBRARY!

OVERSEAS: join here for £18, or join one of our foreign branches: Postfach 7809, 4800 Bielefeld, W. Germany; Jacobsmitslaan 75, B 2400 Mol, Belgium (also covers Holland); 128 B Clontarf Road, Dublin 8; Peder Lykkesvej 33 2300 Copenhagen S Box 1769, Manzini, Swaziland. France & Italy soon. Branch terms vary. All software hired with supplier's permission. YC

Access

ADD-ON EXTRA

Softex

Printer Interface
CBM 64/Vic-20
£20.95

Now that the price of the Alphacom 32 thermal printer has dropped to £54.95 Softex's Printerface looks very good value indeed. It allows Vic and CBM 64 owners to take listings on the Alphacom 32 across 32, 42, or 63 columns. This represents a saving of at least £130 over the cost of a Commodore dot matrix printer.

The Printerface consists of a cable which plugs into the user port, and the software on tape needed to drive it. As well as offering a double height option it handles Commodore graphics characters and screen dumps. Since the Alphacom uses four inch wide paper it is probably not suitable for word-processing purposes but in every other respect compares well with Commodore printers. For an example of its print quality see the listing for the Vic Basic Extensions article in this issue.

Printerface can also be connected to the Sinclair ZX Printer. It is available by mail order only from Softex Computers, Bournemouth Tel: 0202 422028.

Oric Products

Bus Cover
Oric/Atmos
Free

A small piece of plastic is available from Oric products to stop owners from blowing up their Orics whilst groping around the back of the machine to find the socket for the power jack. It covers the expansion bus and can be removed when you want to plug something in.

Ram

Joystick interface
Spectrum
£11.50

The joystick interface is Kempston compatible, and will take any sort of "atari" type joystick, including quickshot II and rapid fire. Unfortunately there is no continuation of the expansion bus. Available from retailers.

HARDWARE *in test*

Penman

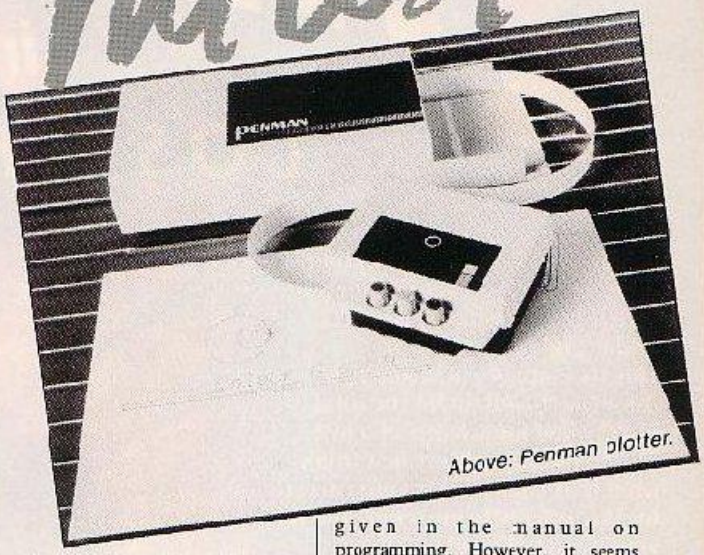
- *BBC*
- *Penman Products Ltd.*
- *£217*

IS IT A plotter? Is it a robot? Is it a mouse? No, its Penman. Set this handy little gadget down on a piece of paper and away it goes plotting smooth lines in three colours. You can also draw curves using polar co-ordinates.

With a suitably white piece of paper on a black background, the Penman will initialise itself and find the corner of the paper using its light sensors. The three pens drop in to their holders and the mobile robot is connected to its base by a ribbon cable. Despite its size it is capable of good resolution — 0.03mm — and tight circles. Its performance certainly compares well with conventional flat-bed plotters.

Not content with this, the Penman can be used like a "mouse", or a "rat" to be exact as it has no actuate button. Two light sensors are built-in to enable the unit to find the edge of the paper and these can be used to digitise pictures although the resolution is rather low.

The software is only available on disc and has a number of demonstration routines and utilities. The utilities show you how to incorporate commands to the Penman into a Basic program, as well as using direct single letter instructions. The software can also be used with the Acornsoft Logo language.

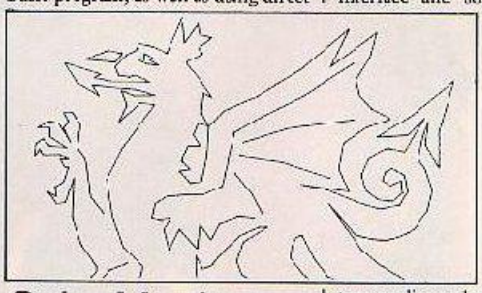


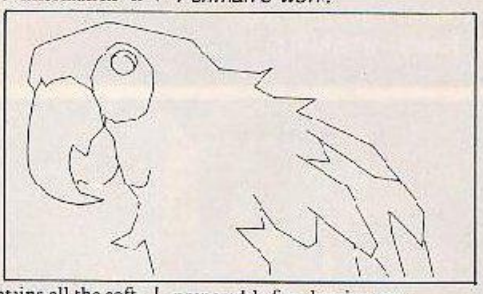
Above: Penman plotter.

Standard plotter pens are used which are widely available in a variety of widths and colours. You can even use a humble Pentel!

In theory, Penman could be used with any computer with a serial interface and some information is given in the manual on programming. However, it seems likely that the machine's big market will be in schools where it can demonstrate the simple principles of robotics, and might come in handy for plotting results or charts. The unit appears rugged and should stand up well to the classroom environment.

Below and left: Examples of Penman's work.





Oric Modem

- *Oric/Atmos*
- *Oric Products*
- *£99.95*

WINNER OF the "coming soon" award for late arrival two years running, the Oric modem, announced at the launch of the Oric-1 has finally arrived. Oric have stuck with their policy of badging-up a tried and tested product and designing a custom interface. The modem is plugged into a new-style BT phone socket and the phone is plugged in to the modem. The phone can still be used normally.

A short piece of ribbon cable connects the expansion port to the small, slim box containing the interface which is connected to the modem by an RS432 cable. This interface will be built-in to Oric's new IQ164 computer which can be connected to a wide range of modems.

The system software is available on tape or disc and contains all the software necessary to use the computer as a Prestel terminal. Although a half-duplex 1200 baud mode is available this is not used by the software, and insufficient technical detail is given for the user to attempt to write such software himself. Oric do say that some communications software is under development. The Prestel software is pleasant to use with the keyboard conveniently redefined for Prestel commands.

The computer's memory is used as a buffer so that pages the user wants to store are filed, and then dumped to tape or disc offline.

For business users, a separate company, Cytel is also marketing the modem. For an extra £45 you get the same hardware but with the Cytel software. This is an improvement on the Oric software, although it is only available for the Atmos. It features auto I/D and password transmission and has an offline message buffer, allowing mailbox messages to be prepared before logging on.

This software is obviously only worth it if you plan to use Prestel very extensively. One gripe is that you can't view a catalogue of programs stored on disc. However, Cytel do say that users will get software upgrades when these become available.

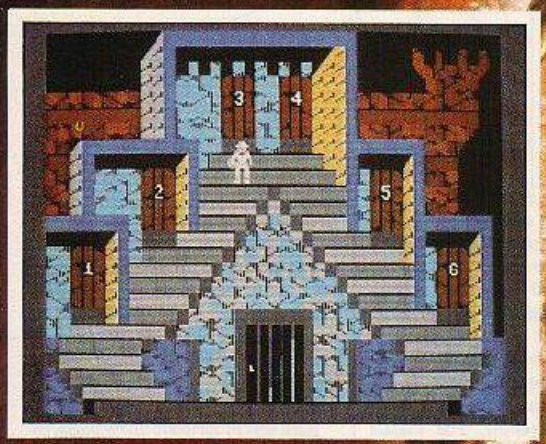
Both sets of software allow pages to be recalled and printed on an Epson-type printer, double size. The modem was completely reliable during testing and the software performed competantly, occasionally getting tied up with hamfisted treatment. But for the price, it looks bad value for money beside some new releases. However, this is the only modem with software designed for the Oric, although Protek have one in the pipeline which will have communications software as well. Micronet has no plans to support the Oric at the moment, but much depends on the demand from Oric owners.

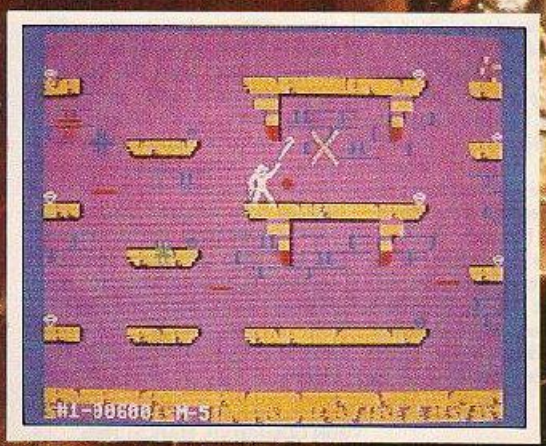
INDIANA JONES™*

in the LOST KINGDOM™*

The artifact is just too tempting. Sure, no one has ever returned with it but they didn't have your brains and courage.
This treasure is worth any risk. An artifact containing the total history and knowledge of a lost, forgotten civilization! Just think what that could do for your career, for the university museum, and for your bank balance!
Of course, there is the small matter of finding it. The perils en route are sure to be the most fiendishly clever traps and puzzles you've ever faced. You'll need all your skill and daring just to survive.
Then there's the ancient curse . . . but what the heck; if it were easy, it wouldn't interest you, Dr. Jones – would it?

C64
CASSETTE
£9·95





Distributed in the U.K. by U.S. Gold Limited,
Unit 10, The Parkway Industrial Centre,
Heneage Street, Birmingham B7 4LY.
Telephone: 021-359 3020.

MINDSCAPE INC

*INDIANA JONES IN THE LOST KINGDOM, game elements and character names and likenesses are trademarks of Lucasfilm Ltd. Used by Mindscape, Inc., Authorised User.
© 1984 Lucasfilm Ltd. and Mindscape, Inc. All Rights Reserved.

Star chart

Maze
BBC B
Acornsoft
Maze game
£9.95

★ ★ ★

3-D mazes have been around on home micros almost as long as bat'n ball games. Acornsoft's is a highly superior version which enlivens the basic concept with bullet-firing robots, lifts, and fast scene changes. Equally pleasing is the way it mixes colours to decorate the corridors in a range of soothing pastel shades.

Labyrinth
BBC B
Acornsoft
Arcade adventure
£9.95

★ ★ ★

Roam seven levels of a labyrinth in search of the extraordinary seventh crystal. On route you can shoot or crush a variety of exotic creatures, or replenish yourself by eating fruit. The idea behind the game is far from novel but the way it is executed — smooth scrolling, superb animation — lifts it out of the ordinary: another confirmation of Acornsoft's return to form.

Break Fever
CBM-64
Interceptor Software
Educational
£7

★ ★ ★

Hey you! No matter what your crew this is the plastic with a program for you. Break dancing on computer with a pre-recorded track — are you bad news or just slack? Crucial, well hard, cronic man, too styley, murder — maybe that's you.

Stylo, wacked, they've got all the terms; try some wild style and burn baby burn. Written by Hardip Mothada and Dennis Reilly, this game consists of manipulating a break dancing figure using a joystick. You can do donkey kicks, space shuttles, headspins, flips, back slams and backspins.

SOFTWARE Shortlist

Match Day

- *Spectrum 48K*
- *Football Action*
- *Ocean*
- *£7.95*

★ ★ ★ ★

THE THRILLS of *Match of the Day* and — no Jimmy Hill. To some extent Ocean has realised that football fans' dream with Match Day! For well over a year International Soccer for the Commodore 64 has been unchallenged as the top football action game for any computer. Now the Spectrum is back in the running.

Of course the limitations of the Spectrum's screen handling makes Match Day's graphics inferior to the CBM-64 game. But Ocean's program compensates for the poorer graphics with subtler controls which allow you to develop a whole variety of ball-playing skills.

Imagine watching a match from the TV camera's gantry high up in the main stand. That's the view you have of the action which scrolls smoothly as the play moves from one end of the field to the other.

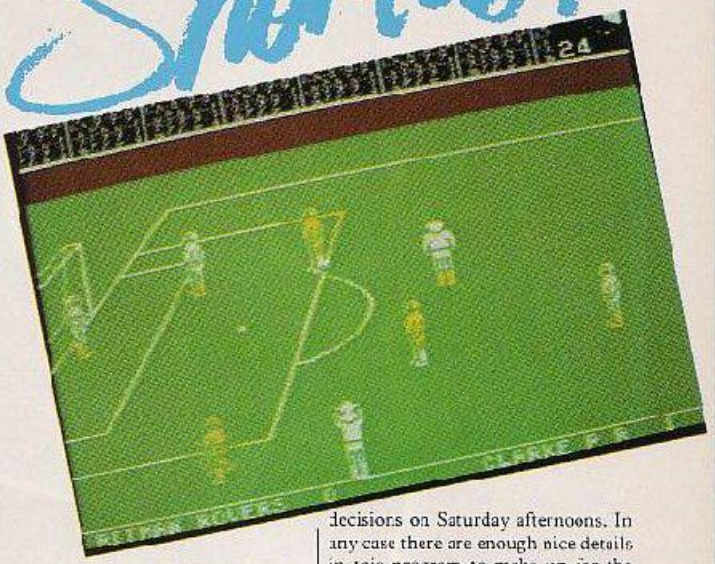
Match Day is a two-player game or if you want some really tough opposition try out your own brand of total football on the computer's International level. It's the top level of three and it never puts a foot wrong.

The program's Amateur and Professional games are also very good but beatable, and they are the only place to start if you've never played before — especially when you are trying to perfect the penetrating throughball.

Set pieces like corners, throw-ins and goal kicks can be very finely timed and crushingly effective. In situations like these, as in the normal run of play, you can vary the angle and the pace of the ball. Probably one of the most difficult techniques to master using the joystick is the diagonal crossfield pass along the ground. But once you have got the hang of it, it really can cut the computer's defences to shreds.

Control passes from one team to another according to whichever is closest to the ball. Although that may sound simple, trapping and controlling the ball itself is another matter. The only way to do that effectively is to watch the ball's shadow and move your man to where you expect it to land.

As the slightly arthritic-looking players troop out on to the pitch to a rendering of the *Match of the Day* music, you might wonder what Jimmy Hill would make of some of the refereeing decisions the computer allows. The goals scored directly from throw-ins would certainly make that famous chin drop in disbelief. And most commentators would soon run out of clichés if in real matches the ball were to stick unmovably behind the goalkeeper for a whole half at a time.



But you soon get used to that — just as you learn to live with bad decisions on Saturday afternoons. In any case there are enough nice details in this program to make up for the shortcomings. It's good to be able to name your own teams, choose the colours they'll be wearing as well as the competition they are playing in. All in all, a credit to the game.

Toby Wolpe

1985 The Day After

- *CBM-64*
- *Mastertronic*
- *Tunnel twister*
- *£1.99*

★ ★ ★ ★

THIS GAME GETS four stars because it's value for money (cheap). Compared to other Mastertronic programs, this one shows great style — so much so that I thought they would have it on a different price scale. But no, it's still good bargain basement stuff. The game itself has nothing to do with Anthony Burgess, George Orwell or American TV movies about the third world war.

You fly a lunar module lookalike off its launch pad, sideways along a tunnel, then up and out into outer space. Position the lunar bug over one of the brightly coloured moons hanging in the sky and you instantly tesseract into a different landscape.

Here your job is to collect little pink dots or nuclear plasma, as the technically-minded term this phenomenon. Passing UFOs — exactly like the ones in the classic Gerry Anderson TV series "UFO" — hinder the garnering process.

Using the lunar teleports you can jaunt off to 12 alien landscapes according to the inlay — I only managed three that looked radically different. If you are an ace spacer, you qualify to collect the fusion core from the last most difficult cavern. The main problem for the novice space trucker is getting out of the hanger. Once you've mastered attitude and thruster control, together with the use of the tractor

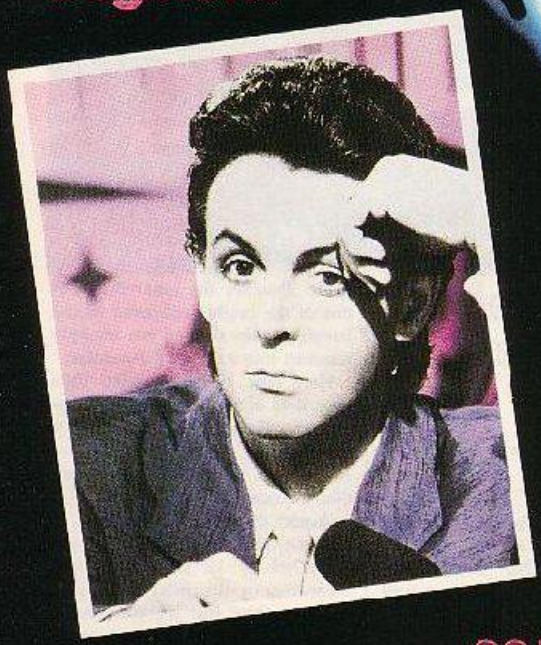
(continued on page 39)

...7 busy characters, 10 lost chords, 12 hours, 48 Traffic Wardens, 95 London Tube Stations, 126,720 square feet of London, 7 million Londoners... 943 action filled screens.

PAUL McCARTNEY'S *Give my regards to*

BROAD STREET

When the music stops, the mystery begins...



MIND GAMES

COMMODORE 64 – £7.99

Argus Press Software Group

© 1985

mpL

20th Century Fox

Star chart

Penetrator
CBM-64
Melbourne
Arcade
£6.95
★ ★

Hailed as the best version of Skramble for the Spectrum, Penetrator now makes a belated appearance on the CBM 64 a machine already well catered for Skramble-wise. Not one of the great CBM Skrambles perhaps but deserves a place in the top 10 for its excellent graphics, rousing soundtrack, training mode, and — a new feature — an option for redesigning the landscape.

Pyjamarama
Amstrad CPC-464
Amsoft/Mikro-Gen
Arcade adventure
£12.95
★ ★ ★ ★

Excellent graphics, a reincarnation of the game that attracted so much praise when it first appeared on the Spectrum. Find the alarm clock and wind it up to end Wally's nightmare. You have to pick up objects to achieve this goal, and an interesting feature is the way you can change the objects by passing over them. Makes some software houses look like wallies by comparison.

Finders Keeepers
Spectrum 48K
Mastertronic
Platform
£1.99
★ ★ ★

If you've never played a platform game, then this one might be worth a try. Your quest is to travel round the castle of Spriteland, collecting up treasures which the king has carelessly left scattered around his castle.

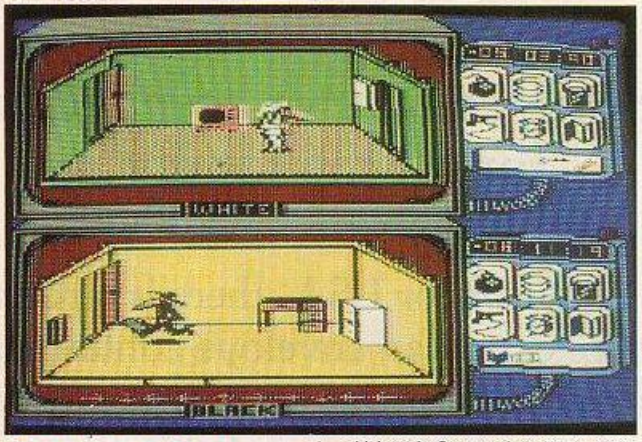
There are the usual collection of baddies trying to kill you, a maze and a large number of screens. You can only carry five objects at a time, and you can then trade them for cash, or be a good fellow and return them to the king.

(continued from page 37)

beam, the game becomes a real tooth-clencher — an orginal approach to the Lunar Lander stereotype. This game puts substance in the image that Mastertronic tried so hard to create in their first days; that of being a real threat to the established pricing structure of the home computer software market.

Paul Bond

SOFTWARE Shortlist



Spy vs Spy

- *CBM-64*
- *Beyond*
- *Arcade Adventure*
- *£9.95*

★ ★ ★

ESPIONAGE HAS COME on a long way since the cartoon strip Spy vs Spy first went undercover in a 1960 edition of *Mad* magazine. Buckets of water, metal springs and guns attached to pieces of string are hardly the tools of the cloak-and-dagger trade that Smiley or any of his people would recognise.

But together with anarchist-type bombs with fuses and exploding alarm clocks they make up the armoury you use to outwit your opposite number and to escape from the embassy with a briefcase full of secret documents.

Two players can play this maze game or you can try your luck against the black spy controlled by the computer. You can even stack the odds in favour of your spy's mission by giving the computer a low IQ. Game options also include maze difficulty as well as keeping the door leading to the get-away plane hidden until all the objects have been collected.

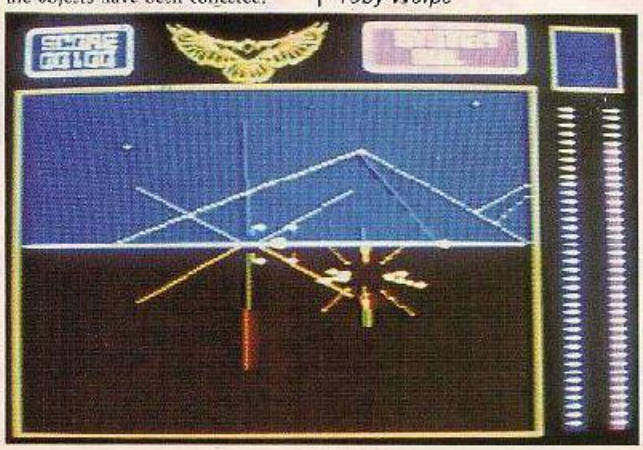
Although Spy vs Spy is no more than a maze adventure of the collect-the-objects-and-escape variety, the split-screen graphics and animation are very good. You can watch what nasty surprises your opponent is preparing for you on his screen and take evasive action by collecting the right object to protect you from it — umbrellas hidden behind coatracks are the only answer to the old bucket-behind-the-door trick.

To the right of the two screens are the Trapulators. Spies switch over to them to select the booby-trap they need or to look at the map. They also show the objects you are carrying, and the time left to complete the mission.

When you stumble across your rival secret agent searching for objects, it's hand-to-hand combat time. The only other option is to run and if you do, you risk losing items.

These combat sequences are fought out with wooden clubs, and the joystick movement you adopt determines whether you are going for a jab to the stomach or the head-smash. The loser dies and not only has the indignity of fluttering off to heaven in the form of an angel but also loses precious time.

Toby Wolpe



Stellar 7

- *CBM-64*
- *US Gold*
- *3D Matchstick Tanks*
- *£9.95*

★ ★ ★

I WAS A LITTLE surprised to find myself earthbound in an Atariesque Battle Zone scenario when the program eventually loaded — from the cover picture I deduced that I would be thrown headlong into some three-dimensional outer space shoot-'em-up, wreaking chaos in the vastness of the cosmos. But getting around between the seven star systems in the game is achieved by driving your XCV Agl-2 Raven vehicle straight into a Warplink. You only get to see one of these when you have vanquished everybody locally.

Grabbing a statistic out of the air, only three orginal games have been written for the Commodore 64 — and this is obviously not one of them. But then most machines, except for the proud and haughty BBC Micro, now have a commonalty of software that extends far beyond the ubiquitous Space Invaders. This is a stylish implementation with some nice touches. The cassette contains a Raven Manual — an essential prop to those intent on living out the delusion that they are an interplanetary tank commander. Quite mad and so young.

Once you have got your code nine security clearance you'll be able to appreciate some of the finer control features. There is a zoom lens option on the viewscreen which enables you to identify distant objects. Naturally, you have protonic shields whose current strength is indicated on the blue gauge located on the right side of your viewscreen in the leftmost position. You can also render the Raven invisible — a well known spin-off of protonic shield technology. Once you've got the hang of all this, you can go in for the advanced driving test.

Tips and hints are provided: don't refuel at a fuelbay until it is time to warp out, fuel-bays can only be used once. There are lots of tactical manoeuvres to master like "the move" and "firing in the interim".

Why all this technology is necessary when the enemy is plainly reduced to constructing its hardware out of matchsticks has always been beyond me. Still they pack a nasty punch, and as it says in the manual, the guiding principle of all these manoeuvres is simple: hit your target without getting hit. Receiving you loud and clear. Over and out.

Paul Bond

(continued on page 41)

Sponsored by YOUR COMPUTER

Win £1000 and a flight on Concorde

MICROCOSM

—the exciting computer competition book for all the family

Somewhere in the UK or USA, there is a room in which there's a telephone, and an envelope containing a person's name. The winner of the prize is the first person to ring the room, and state the name sealed in the envelope.

It sounds simple—try it and see!

Getting Started

Microcosm contains thirteen verses and stunning colour illustrations. At the back of the book is a simple computer program. Getting started is easy:

1. Type the program into your computer
2. Study the 13 verses, searching for a common theme linking one line from each —use the illustrations for clues
3. Type in the 13 lines you have chosen, together with a letter key taken from one of the illustrations
4. If you've chosen correctly, the computer will print a message. When you've got 13 messages, you'll be led on to the next part of the puzzle.

New Clues

For the first time since Microcosm's launch, we're releasing two clues to help you on your way:

Each page contains a line incorporating the name of a personal computer—there's *one* theme! Only 12 more to go!!

How much do you know about George Washington?—he features in every page!

TAKE UP THE CHALLENGE!

£6.95

Microcosm is available from W H Smith, Boots, Dillons, Hudsons and all good booksellers.

Buy your copy today—and get your friends and family to take up the Microcosm Challenge.

Pitman Publishing, 128 Long Acre, London WC2E 9AN

Star chart

Mr Wong's Loopy Laundry

Amstrad CPC 464
Artic
Platform game
£8.00
★ ★

Average game in which Mr Wong has to collect his laundry whilst being pursued by a flying iron, a sack of laundry and soap suds that are definitely not soft. The hardpressed Chinaman moves right and left and up and down the ladders dodging the hazards and collecting the washing. A platform game is a platform game is a platform game.

Brian Bloodaxe

Spectrum 48K
The Edge
Arcade adventure
£7.95
★ ★

Over-hyped little number from the cutting Edge of Softek. Features over 100 screens, with more than 300 foes weapons and surprises. Every screen presents a logical problem — but what computer game doesn't? Graphically pedestrian, should have been released on the Softek label at a more reasonable price. Plays Sousa march, as per Monty Python — an old BBC TV comedy series, apparently.

Sentinal

CBM-64
U.S. Gold
Arcade/Strategy
£9.95
★ ★ ★

Star Raiders is widely regarded as a classic. Until now only available for the Atari, Sentinal is a conversion to the Commodore. Your job is to destroy the alien bases whilst stopping the ships from attacking your bases and home planet — their ultimate goal.

This requires a nice balance of defence and attack, as well as speed and reflexes. Despite being a classic in its time, it does look a little dated next to some more recent releases

SOFTWARE Shortlist

(continued from page 39)

Zaga Mission

- *CBM-64*
- *Anirog*
- *Chopper hopper*
- *£7.95*

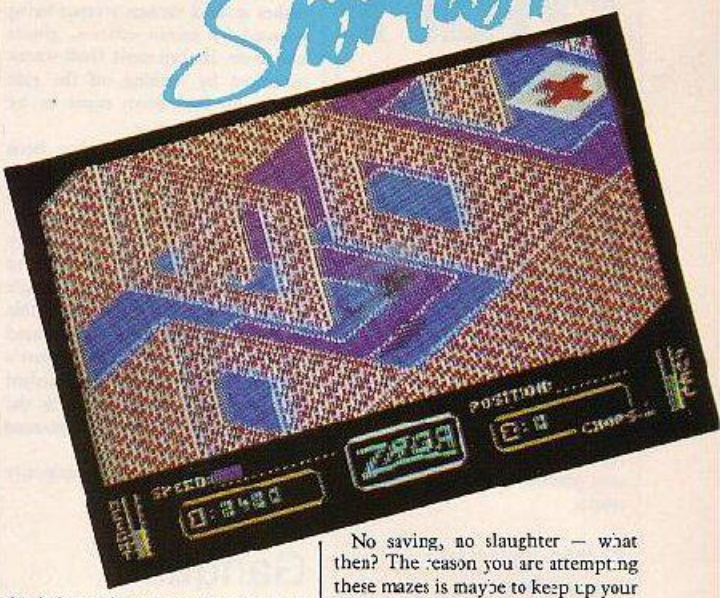
★ ★ ★

THERE ARE so many helicopter games on the market now that software reviewers leaving their offices adopt the crouching run peculiar to heavily-armed people disembarking from Bell Hueys in open country.

Zaga Mission, slicing two quid off your average Commodore cassette software price, hovers somewhere between the genre of Choplifter and Zaxxon, but owes more to the latter, the screen display being a three-quarter 3D scrolling view of a Bomb Alley cluttered with convoluted brickwalls guaranteed to wreck your cyclic pitch.

Main carps about this program? You can't fly backwards — unlike a real rotorcraft — and it's kind of slow: you'd expect the inhabitants of planet Zaga to come up with something a little more nifty. For those with a destructive bent there are no fuel dumps to torch; nor can you do your soul good by winching distraught matchstick figures out of hostile territory.

Plusses? Great sound — turn the volume up and put your ear defenders on. The graphics are great too, but it is sometimes hard to figure out exactly where you are in relation to obstacles — the 'copter casts a shadow on the ground though, and



this helps a bit. The aerial manouevring faithfully reflects the tendency of early helicopters to swing or torque — so watch you don't bash your tail-rotor against a wall as you go round corners, or else it's DIK-DIK-DIK-KA-BOOM-SPLAT! (Technical term used by mature adult computer journalists while relaxing with a glass of Lucozade after picking over the finer points of a nice juicy piece of machine code.)

No saving, no slaughter — what then? The reason you are attempting these mazes is maybe to keep up your flight pay? No way, Jose — your goal is to reach the malfunctioning power plant that keeps planet Zaga 1 safe from harmful cosmic bombardment. As a result of the fault, security doors are opening and closing erratically — another hazard. You can gas up after each maze — but the limitations of your operational range are a further handicap in your attempt to save your world. A helicopter of a game.

Paul Bond

Drive-in

- *Spectrum*
- *Fantasy*
- *Arcade adventure*
- *£5.50*

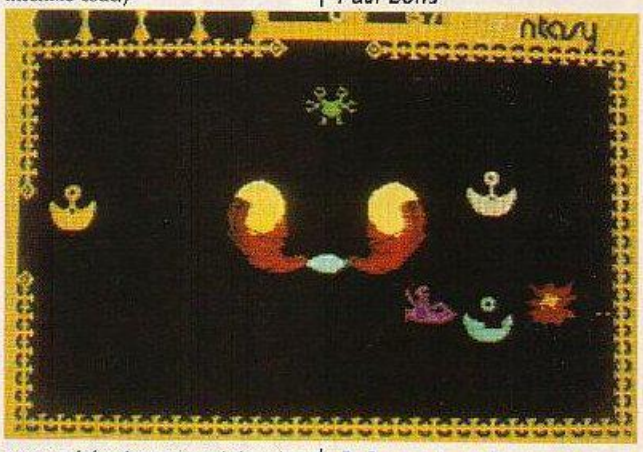
★ ★

GOOD STOCK Fantasy stuff — 189 screens, 28 different aliens and various objects to be collected. If this software house were a movie star it would be Clint Eastwood — there is a strict unvarying formula to all their products which must presumably be popular with the user.

This is one of those games where you have to reassemble your spaceship by collecting all the various bits. A slight twist is added by the fact that the central character — the one doing all the zipping about and zapping is a superheroine called Dezzy. Beautiful she may be but a big space suit and only a few pixels make it hard to tell.

What happened to Ziggy, the customary star of Fantasy games? Well, Dezzy is on her way to help him. Lured into an abandoned drive in by the villain of the piece she has to piece together an old starship to escape. This must be assembled in the correct sequence inside room 189.

You can use a joystick or keyboard



to control the character and there is a keyboard redefining option. You use keys 1-4 to pick up and drop objects when Dezzy is directly over them.

You can also score by shooting the aliens, of course, but when the points score reaches 10,000 it resets to zero and the percentage completed of the game increases. You don't just collect objects — you can also trade them for other objects and some of the rooms have automatic garages, banks and time machines. These can all be used to assist you complete the game. It's a little bit like a poor man's Atic Atac, but for people who like compiling maps and puzzling over functions of gadgets, I'm sure it'll be a great hit.

Paul Bond

Monty is innocent

- *Spectrum 48K*
- *Gremlin Graphics*
- *Arcade adventure*
- *£6.95*

★ ★

GREMLIN Graphics' character Monty first came to prominence in Monty Mole — a game which trod on a few nerves with its references to the miners' strike — especially in view of the fact that the author was the son of a pit safety officer.

In an attempt to redress the balance, we find Monty has been

(continued on next page)

Star chart

Automan

CBM-64
Bug-byte
Platform and maze
£9.50

★ ★

One of a series of average games being boosted by a link with a TV series.

Below average quality graphics on the opening screen — a tedious platform game — dulled any enthusiasm aroused by the packaging. Quality of programs must improve, or home computers in the UK will go the way of the hula hoop.

Dam Buster

Oric-1/Atmos
IJK
Simulator
£8.50

★ ★ ★ ★

No micro can be considered complete without its very own flight simulator. This is the first program for the Oric/Atmos worthy of the name. While not up to the Spectrum/Commodore standards, it has all the usual features of maps instruments and out-of-the-cockpit view.

The scenario is interesting, precision bombing, requiring tricky co-ordination of speed, height and position. Perhaps Oric/Atmos owners can look forward to further refinements of this. Aerobatics are out, and the landing process is rather abstract, instruments only.

Therbo

Spectrum 48K
Arcade
Shoot-'em-up
£5.50

★ ★ ★

A sort of cross between rollerball and American football, Therbo consists of protecting a ball from the computer which is trying to knock it into touch.

You have a large armoury — for a ball game at least — of missiles, mesmos and thrustas to help you guide the therbo up the field, and frustrate the computer's efforts to do the same. Nice graphics with sideways scrolling, and a tricky game to master.

(continued from previous page)

reduced to stealing coal and has been imprisoned for this.

The aim of the game is for Monty to get the key from the prison governor's office and escape. He rushes around various screens being pursued by prison officers, ghosts and so on. He can move from screen to screen by rushing off the side sliding up and down ropes or by falling down holes.

Plenty of imagination has been used to create the backdrops — there are a couple of good 3D mazes and an ingenious sequence in a gymnasium. Money received from sales of Monty Mole was destined for donation to the Miner's Welfare Fund — though at the time of going to press, this body still had not made up its mind to accept the gift. The Miner's Welfare Fund is an established charity which existed prior to the strike. No such donations are planned this time.

A competent and graphically inventive game.

Paul Bond

Gandalf

- *CBM-64*
- *Tymac*
- *Shoot 'em-up*
- *£9.95*

★ ★ ★

ONE WOULD have thought that a name like Gandalf would create a lot of copyright problems — upsetting the administrators of the Tolkien estate makes a visit from the Ringwraiths seem pleasurable by comparison.

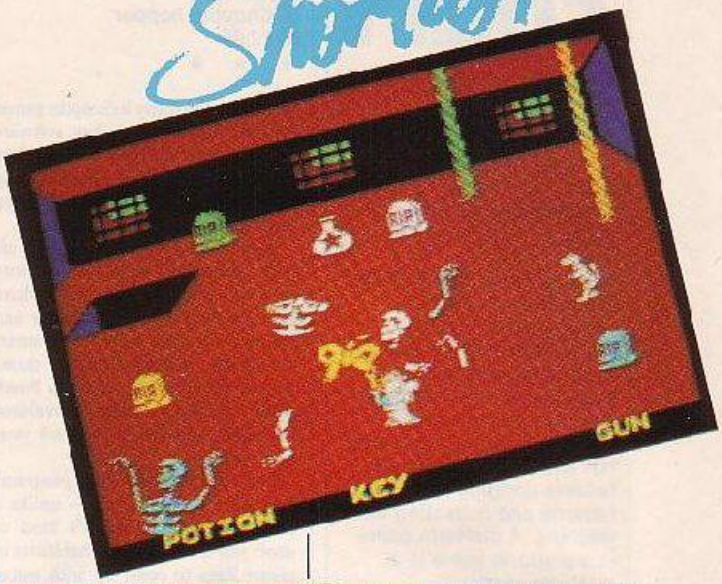
Speculation apart, this is an ingenious game with very nice graphics. It has nothing whatsoever to do with the Lord of the Rings, apart from hijacking the old sorcerer's name.

The screen display shows a castle wall with two turrets. In the distance large T. Rex-style saurians are waffling through the tulgey woods. These are in fact scaly-tailed lizard men keen to augment their schemes for financial investment by relieving you, Gandalf, of your treasure which is protected by the customary ancient spell, third party, fire and theft. In other words, it's wizards versus lizards.

The slimy reptiles intend to achieve their aim by abducting your apprentices and holding them for ransom. You can prevent this by directing lightning bolts down on the vile kidnappers. The joystick controls the movement of the wizard and the direction of his power. To direct the wizard's power you just move the cross-hairs around the screen and then press the firebutton. To move the wizard himself around you have to hold down the button and waggle the joystick. If your power drains you have to shift the necromancer up the shining tower smartish and replenish his batteries from the shining star. There is a deadly spider knocking around behind the battlements and like most giant arachnids it leaves you feeling pretty sick if you bump into it.

Zapping the lizards turns them into gold coins. This is of crucial importance to the second screen since

SOFTWARE Shortlist



the waves of reptiles are so inexorable that sooner or later they are bound to get past the gate and make off with a member of your youth opportunities scheme.

Being a good employer you give chase, and set a power bolt trap in the path of the lizard man. When the trap destroys the lizard you can retrieve the apprentice by brushing against him and returning to the castle. Then you have to retrieve the trap. You can also collect the gold coins lying around. But as always — remember to watch out for the yellow ostrich — it will steal the coins. The best computer games always have a moral of some sort, and it's true that you won't go far wrong in life if you watch out for the yellow ostrich.

Paul Bond

Back Track

- *Dragon 32*
- *Incentive Software*
- *3D Maze Game*
- *£6.50*

★ ★ ★ ★

No, we haven't forgotten about the Dragon, but a lot of the software companies have.

This really does take the Dragon 32 to its limits. You are given an overhead view of one of the rooms with Eddie in the middle.

It transpires that Eddie is held captive by the mad professor who is cruelly plumbing the innermost depths of the human psyche. As a worse torture than watching endless re-runs of the Paul Daniels show, the professor has designed a series of five labyrinthine tests of increasing complexity to see if Eddie's will to live can be broken — his will to live is shown as a barometer on the left of the screen. Objects are automatically picked up as Eddie enters a room and his willpower is boosted. Eddie has to reach the exit, finding keys in the correct order before he can get out.

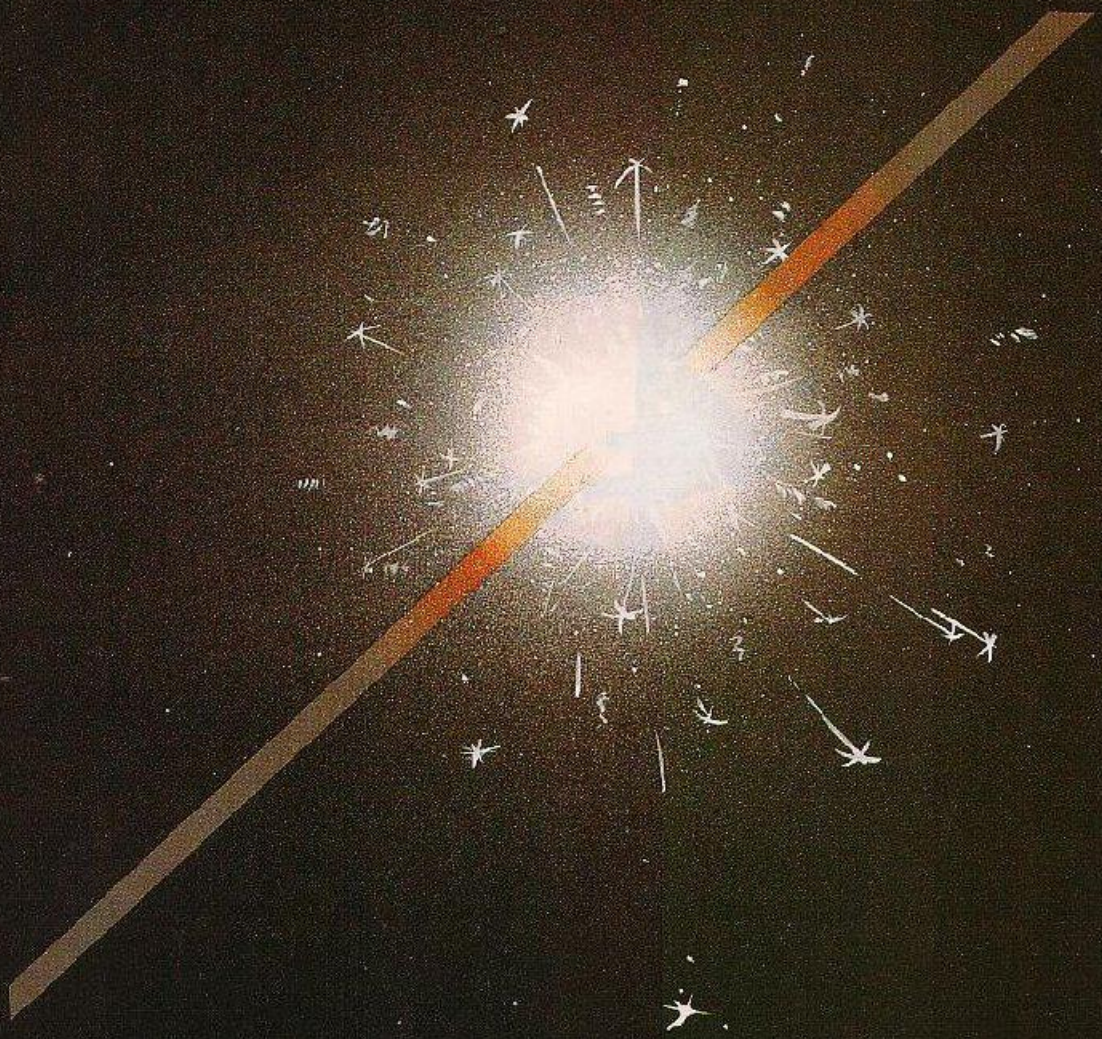
Pressing the M key displays a map — if Eddie has found it — and pressing any other key returns you to the main display.

Watch out for somewhat sleepy serpents and the prof's pet genetically-mutated rug, which objects to being walked on too much.

All in all, an enterprising effort by Chris Andrew and what a pity software companies didn't produce more of this kind of quality software before the Dragon had the rug pulled from under it.

Paul Bond

CONFUZION



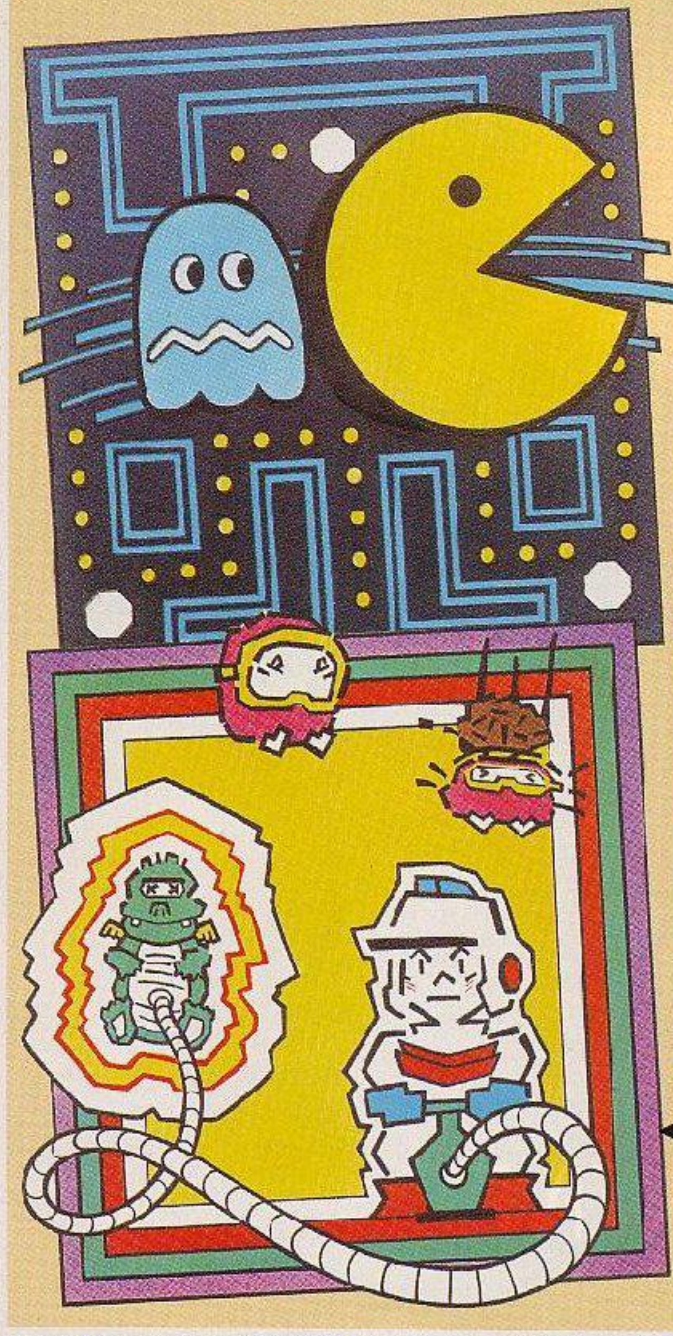
INCENTIVE

U.S. GOLD

Premier Arcades from Datasoft

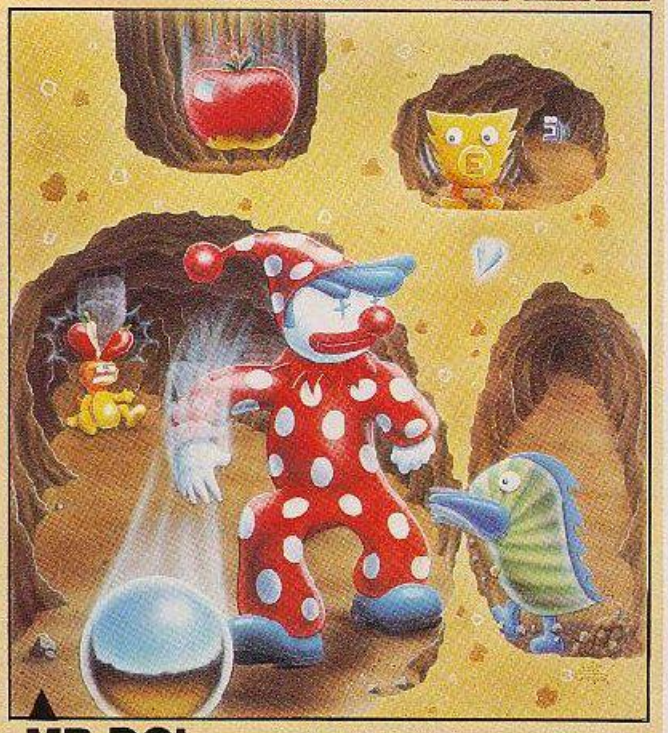
64 ATARI

The Genuine & Original Arcade Favourites



As licensed by leading American Arcade Game manufacturers to Datasoft®

featuring the original PAC-MAN



	CASSETTE	DISK
MR. DO!	£9·95	£14·95
DIG-DUG		
PAC-MAN		

THE ULTIMATE IN AMERICAN SOFTWARE FOR YOU ON U.S. GOLD

U.S. Gold is stocked by all leading computer stores including:

Boots John Menzies WHSMITH WILDINGS WOOLWORTH

Pac-Man® and characters are trademarks of Bally Midway Mfg. Co. ©1980 for the Western Hemisphere. Trademarks of Namco Ltd. ©1980 throughout the rest of the world. Licensed to Datasoft, Inc. by Namco-America, Inc. Dig-Dug™ is designed and engineered by Namco ©1982. Licensed to Datasoft, Inc., by Namco-America, Inc. Mr. Do is a trademark of Universal USA, Inc. ©1984. Datasoft is a registered trademark of Datasoft, Inc. Premier Arcades is a trademark of Datasoft, Inc. ©1984 Datasoft, Inc. All rights reserved.

NEWS oaeo rsou ttttt h h

The crystal ball

MSX micro owners — rejoice! Level 9 Computing have made all of their celebrated adventures available on cassette for your micro. Priced at £9.95 each, such superb games as Colossal Adventure, Adventure Quest, Dungeon Adventure, Lords Of Time, Snowball and Return to Eden can now be played on your new MSX. You can't call yourself an adventurer until you've experienced one of Level 9's programs. Worth buying an MSX for.

Father than use scruffy old pages torn out of a school rough book, you could do no better than invest £3.95 in a pad of 50 Adventure Planner sheets from Print N' Plotter Products. Each large sheet is high quality paper preprinted with 150 interconnecting location boxes.

The sheets are ideal for designing your own adventurers or keeping an impressive permanent record of a completed game. Excellent value.

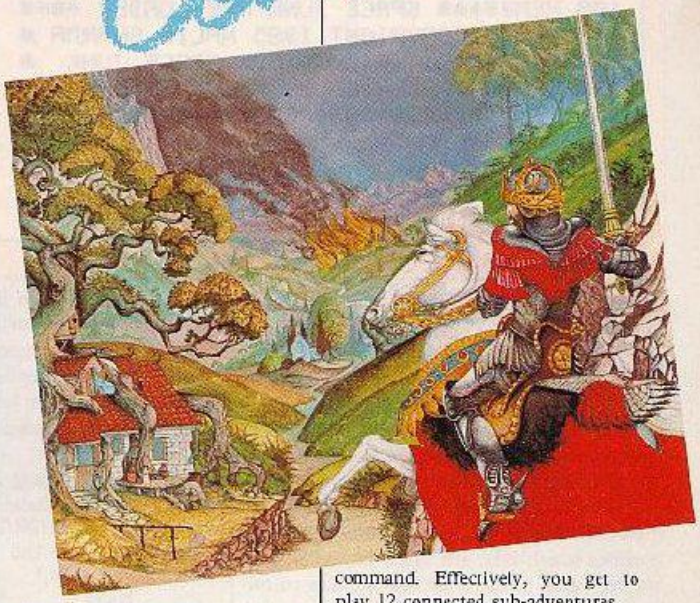
A helping hand

Adventure International's Sorcerer of Claymorgue Castle is obviously giving quite a few of you adventurers a lot to think about. Once again, Scott Adams' mischievous mind has caused the heavens to ring with pleas for help. Here's a morsel of assistance:

Can't get up to the loft in the ballroom?
LLEPS THGIL TSAC NEHT REILEDNAHC NELLAF NO DNATS
Nothing useful in the kitchen?
STENIBAC EHT NI KOOL A EVAH
Haven't met the dragon yet?
NWOD HSUP DNA MOOR NIALP OT OG
Yours in castles and caverns.
HUGO NORTH

QUEST Corner

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.



King Arthur's Quest

48K Spectrum
£7.95
Hill MacGibbon

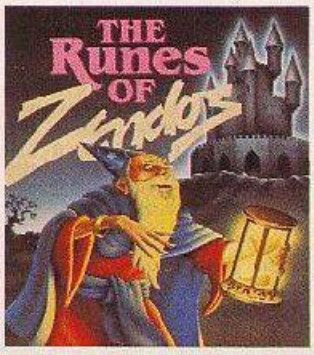
KING ARTHUR'S QUEST is a graphics and text adventure that takes you through Camelot, currently under Morgana's wintry spell.

The land is split into eight areas: Merlin's Tower — where you start, the wilderness, enchanted forest, keep, chapel, crypt, cavern and Morgana's Castle. Each area is based on a grid of 10 by 10 squares.

Every time you move, you progress one square and are presented with a forward view of the surrounding area. Permanently on view are Excalibur which slowly turns red as your life-force diminishes and a picture of every object in your possession.

The bottom of the screen is used as a scrolling text window, recording your commands and allowing Grymalkin the cat, your faithful companion, to furnish information on objects, incidents, etc.

Commands are given by single-key entries. You don't have to memorise them — a keyboard overlay is provided. There are only eight actions you can perform: turn left or right, move forward, take, leave or use an object, eat/drink and cast a spell. You can also repeat a description, cancel a command, save and restore a game.



Among the characters you'll encounter are a jester, griffin, and owl. Characters may help you — if you help them. The graphics are simple but effective and the text character-set has been designed to look like authentic manuscript. Some sound effects have been included. An enjoyable game of exploration and discovery for the younger adventurer.

Runes of Zendos

48K Spectrum
£7.95
Dorcas Software

ZENDOS IS AN animated graphics and text adventure with some similarities to its predecessor, Oracle's Cave. If you liked that, then chances are you will enjoy this one.

The screen is divided into two, the top half displaying a side-on view of part of a room which scrolls horizontally or vertically in response to your chosen movement. The lower half is used for textual commands and responses. Commands can range from the terse — l for go left — to the verbose — attack the guard with the mighty axe.

You are shown as a small white-clad figure whose mission it is to seek out and destroy the wicked wizard Zendos. He has separately imprisoned the spirit of each month — you must find and release all 12 spirits. Each section of the castle is split into several chambers.

Since each of the spirits is located in a different section, the program kindly lets you move instantaneously from section to section with a single command. Effectively, you get to play 12 connected sub-adventures.

Apart from your own walkabouts, the animation mostly comes from simply stylised battles with many of the characters you meet. These characters, as in Oracle's Cave, are solidly presented and imaginatively designed. As well as fighting, cracking runic codes and casting spells are other major activities.

As an animated adventure, Zendos works out very well. If you want a change from text only adventures, this should fill the bill.

Project-X the micro man

48K Spectrum
£3.25
Compass Software

A NOVEL and enjoyable Quilled adventure. An accident has miniaturised you and the quest concerns your attempts to return to normal. You'll battle with a mole — but what, given your diminutive dimensions, will you use for weapons? Over 150 locations, 80 objects and original puzzles ensure good value for money.

The Legacy

48K Spectrum
£7.95
Tamsoft

ANOTHER QUILL-BASED adventure, your eccentric grandfather has died and named you as sole beneficiary. To claim your inheritance, you must first find the secret vault by following a treasure trail of clues left by grandpa. A non-violent, pleasantly stretching text adventure.

SPACE JUNK

Listing 1.

```
100 REM***** SPACE JUNK PRE-LOADER ****
110 REM** COPYRIGHT 1985 NALIN SHARMA *
120 REM**  ALL RIGHTS FOR SPACE JUNK  *
130 REM**  RESERVED BY NALIN SHARMA   *
140 REM*********************************
5000 FORX=0TO35
5010 READA
5020 POKE49152+X,A
5030 NEXT
5040 SYS49152
5990 REM**M/C DATA TO LOAD MAIN FILE**
6000 DATA169,1,162
6010 DATA1:REM**CHANGE TO 8 FOR DISK**
6020 DATA160,1,32,186,255,169,10,162,26
6030 DATA160,192,32,189,255,169,0,32
6040 DATA213,255,76,0,64,83,80,65,67
6050 DATA69,32,74,85,78,75
```

Nalin Sharma with the first part of a joystick-only game.

SPACE JUNK is a fast, all action, machine-code game for the Commodore 64. It features ultra-smooth movement of all graphics, including the line scrolling of the planet surface.

The basic idea of the game is to move your spaceship across the planet and retrieve 32 satellites which litter the skies. However, it is not very easy as there are four junkies patrolling the planet and touching them is fatal.

The game is 30K long so it is being published in three parts. To enter the program you will need to type in three listings — listing 3 being the first block of object code for Space Junk. It would be sensible to use three different cassettes — call them X, Y and Z. It is imperative that cassettes Y and Z are C30.

If you are working with disc, change the following:

Line 6010 in listing 1 as instructed.
Lines 2015 and 3015 as instructed, in listing 2.

If you do not feel up to typing the program in, then if you send me £3.25 — cheques/P.O.s payable to Nalin Sharma — together with your name and address I will be happy to send you a copy of Space Junk on a fast loader. Send to: Nalin Sharma, 35 Kitchener Road, Walthamstow, London E17 4LJ.

First of all, type in listing 1 and save it on cassette Z, but after saving it do not rewind the tape, as later the object code must follow it. Listing 1 is the pre-loader for Space Junk. So all it does is set up the kernal to load the object code file — once loaded it will be executed and the game will begin.

Now, before typing in listing 2, you must move the start of Basic upwards as follows:

```
POKE 32768,0    (RETURN)
POKE 44,128     (RETURN)
POKE 43,1       (RETURN)
NEW             (RETURN)
```

Now type in listing 2 and save it on cassette X. Listing 2 is the code-aid which will allow you to enter the object code. It is important that before loading or using listing 2, the start of Basic is moved as shown above.

Once you have checked listing 2 and you have saved it, you can begin to enter the object code — listing 3. So type Run and press Return and you should see a three-option menu, provided that listing 2 has been entered correctly. The menu is as follows:

```
1 = ENTER CODE
2 = LOAD CODE
3 = SAVE CODE
```

After pressing 1 you will be asked from which hex address you wish to start entering the code. This means that you don't have to enter all the code at once — you would be better off typing in only a few hundred lines a day. So if you haven't entered any Space Junk code previously, type in 0800 and press Return. Now the computer will print "0800?" and will await the entry of the line of code. You *don't* have to type in the hex address every time you enter a line.

When entering a line of code, type in the first 16 characters which represent eight bytes of code, then a space, and then the last three characters which represent a checksum of those eight bytes of code. Once you have typed in the line, press Return and provided that the line has been entered correctly, the computer will print "OK" and will go on to the next hex address automatically. If the line has not been entered correctly, the computer will print "TRY AGAIN" and you'll have to re-enter the line.

This system of checking the code as it is entered is very efficient, and it will vastly improve the chances of the program running first time. If at any time you wish to return to the menu, to save the code so you can return to it at a later date, instead of entering a line of code press "*" and then Return.

Option 2 allows you to load in previously saved code. Make sure that your disc/cassette is ready and then press "2". The code will now be loaded. Option 3 allows you to save the object code. Just make sure that your disc/

(continued on page 48)

Listing 3.

```
0800: 007CE6F6DECEC67C 546
0808: 001878181818187E 16E
0810: 007CC6C07CC0C6FE 448
0818: 007CC606306006C67C 2CC
0820: 00C6C6C67E060606 2E2
0828: 00FEC0C0FC06C67C 4C2
0830: 007CC6C0FCC6C67C 506
0838: 00FE06C018303030 1B8
0840: 007CC6C67CC6C67C 48C
0848: 007CC6C67E06C67C 3CE
0850: 0000000FE000000 0FE
0858: 000000FEFEFE0000 2FA
0860: 0000FEFEFEFEFE00 4F6
0868: 00FEFEFEFEFEFEFE 6F2
0870: 007CC6DEC6F6C67C 51E
0878: 0000C0FBFEFBC000 46E
0880: FFFDFBDFDFDFDBFF 79C
0888: FF7F7F7F7F7F57FF 4D0
0890: FFF5DFFFF5DFD5FF 770
0898: FF5FF7F75FFF57FF 600
08A0: 000000FFFF000000 1FE
08A8: 3C3C3CFFFF000000 2B2
08B0: 3C3C3C3C3C3C3C3C 1E0
08B8: FFFEFBEEEFEFFFFC 7A0
08C0: FFEEEEEEAFEEFF00 665
08C8: FFAAFFAAFEAAFF00 5F9
08D0: FFFFFFFFCFCFFF00 699
08D8: FF033F03F303FF00 339
08E0: FF033303F3FFF00 2B5
08E8: FF033303333FFF00 23D
08F0: FF033F3F3F03FE0A 2CA
08F8: FF033F0F3F03AAAA 2E6
0900: 0000000000000000 000
0908: FF03CFCFCF0FBFA0 4DD
0910: FF333333333FFF00 2CD
0918: FF033333333FFF00 2CD
0920: FF33330F3333FF00 2D9
0928: FFFEFEFECECEFF00 694
0930: FFFEBEEEFAFEFF00 6A0
0938: FFEAEFEAFFEAFF00 6AA
0940: FFAFFFAFEFAFFF3F 638
0948: 00020AFFFF000000 20A
0950: 00AAAAAFFFF000000 352
0958: 0080A0FFFFF000000 31E
0960: FFFFFFFFFFFFAAAA 74E
0968: FFFFFFFFFFFFFFFF 7F8
0970: 0000000000001818 030
0978: 7E9999FFFF99997E 55E
0980: 7EF3939FF9C9CF7E 5B2
0988: 7EE7E79999E7E77E 5CA
0990: 7ECFC9F99F93F37E 5B2
0998: 7EE7E79F9FFFFF7E 606
09A0: 7EFFFF9F9FE7E77E 606
09A8: 7EFFFF9F9FE7E77E 6BA
09B0: 7EE7E7F9F9FFFF7E 6BA
09B8: 7EFFE7C7CFFFFF7E 676
09C0: 7EFFFFE7E7FFFF7E 6C6
09C8: 7EFFFFF3E3E7FFF7E 6B6
09D0: 0000181800181800 060
09D8: 001C3030303030381C 138
09E0: 007038181818387038 198
09E8: 0000007E007E0000 0FC
09F0: 0000000000000000 000
09F8: 0000000000000000 000
0A00: 7EC3DBDFDFDBC37E 5F6
0A08: 007CC6C6FFC6C6C6 558
0A10: 00FC66667C6666FC 40C
0A18: 007CC6C0C0C0C67C 4C4
0A20: 00FC6666666666FC 3F6
0A28: 007EC0C0FCC0C07E 4F8
0A30: 007EC0C0FCC0C0C0 53A
0A38: 007CC6C0DEC6C67C 4E8
0A40: 00C6C6C6FEC6C6C6 5A2
0A48: 00FC3030303030FC 2E8
0A50: 007E181818D8D870 2E6
0A58: 00C6CCD8F0CCCCC6 5A8
0A60: 00C0C0C0C0C0E07E 51E
0A68: 00C6EEFEDEC6C6C6 5DA
0A70: 00C6F6F5FEDECEC6 612
0A78: 007CC6C6C6C6C67C 4D6
0A80: 00FCC6C6FCC0C0C0 5C4
0A83: 007CC6C6C6D67C06 426
0A90: 00FCC6C6FCD8CCC6 5EE
0A98: 007CC6C07C06C67C 3C6
0AA0: 00FC303030303030 21C
0AA8: 00C6C6C6C6C6C67C 520
0AB0: 00C6C6C6C6C67C38 492
0AB8: 00C6C6C6D6FEEEC6 5DA
0AC0: 00C6EE7C387CEEC6 498
0AC8: 00C6C6C67E06C67C 418
0AD0: 00FECE1C38706EFE 474
0AD8: FFFEFEFECFCEFF00 695
0AE0: FFAAFFAFFEAAFF00 5F9
0AE8: FFFEFEFEFEFEFF00 6A4
0AF0: FFFFFFFFFFFFFF3F 6D8
0AF8: 000000C0C0000000 180
0B00: 0000030303000000 060
0B08: 0000030C0C000000 018
0B10: 0000000000000000 0AE
0B18: 0000000000FFFF00 1FE
0B20: 0000000FFFF000C0 1FE
0B28: 0000FFFF000000C0 1FE
0B30: FFFF0000000000C0 1FE
0B38: 006CFEFEFE7C3810 42A
0B40: 7ECF8D9999B1F37E 52E
0B48: 7EC3879FF9E1C37E 582
0B50: 7EC381FFFF81C37E 582
```

Listing 2.

```
10 REM*** SPACE JUNK CODE-RIP ***
20 REM*** COPYRIGHT 1985 NALIN SHARMA ***
90 GOSUB4000
100 POKE53280,3:POKE53281,1
1.0 PRINT"□□          ■ SPACE JUNK CODE RIP ■"
1.5 PRINT"□□□              ■ O P T I O N S ■"
120 PRINT"□□□              DLE = ENTER CODE"
130 PRINT"□□              DSE = LOAD CODE"
140 PRINT"□□              DSE = SAVE CODE"
150 GETV$:IFV$=""THEN150
160 V=VAL(V$):IFV<1ORV>3THEN150
170 ONV GOSUB300,2000,3000
180 GOTO100
300 REM *** ENTER CODE ***
3.0 INPUT"■PLEASE ENTER START IN HEX";H$
320 IFLEN(H$)<>4THEN310
330 GOSUB1200
340 DA=DT:PRINT"□□□□"
350 D=DA:GOSUB1000:REM********PRINT HEX ADDRESS*
360 PRINT$;:INPUT+X$:REM******GET HEX INPUT*
365 IFHX$="*"THENRETURN:REM***TO EXIT**
370 IFLEN(HX$)<>20THEN360:REM*CHECK LENGTH
380 CNT=0:FORP=1TO19STEP2:REM*BREAK DOWN*
390 H$=MID$(HX$,P,2):REM******GET BYTE*
400 GOSUB1200:CNT=CNT+DT:REM****FIND CHECKSUM
410 POKEDP,DT:DA=DA+1:REM******POKE& NEXT LOC *
420 NEXTP
430 HP=VAL(MID$(HX$,18,3)):REM*****FIND CHECKSUM
440 GOSUB1200
450 IFDT<>CNTTHENPRINTTAB(29)"TRY AGAIN":DA=DA-8:GOTO350:REM*LINE CHECKSUM*
460 PRINTTAB(29)"OK":IFDP=31008THENPRINT"FINISHED!!!":FORZ=1TO500:NEXT:RETURN
470 GOTO350:REM**END OF LOOP***
1000 REM *** DEC-HEX ***
1010 DD=D:H$=""
1020 IFD=0THENRETURN
1030 IFD>65535ORD<0THENRETURN
1040 FORI=3TO0STEP-1
1050 Z=D/(16↑I)
1060 IFZ<1THENH(I)=0:GOTO1080
1070 H(I)=INT(Z):D=D-(H(I)*(16↑I))
1080 IFH(I)>9THEN1110
1090 H$=H$+CHR$(H(I)+48)
1100 GOTO1120
1110 H$=H$+CHR$(H(I)+55)
1120 NEXT
1130 RETURN
1200 REM *** HEX-DEC ***
1210 DT=0
1220 IFH$="Z"THENPRINT"FINISHED":RETURN
1230 HL=LEN(H$)
1240 IFHL>4THEN12.0
1250 FORI=HL TO1STEP-1
1260 A=ASC(MID$(H$,I,1))
1270 IFA>60THEN1300
1280 A=A-48
1290 GOTO.310
1300 A=A-55
1310 DT=DT+(A*(16↑(HL-I))):
1320 NEXT:
1330 RETURN
2000 REM****LOAD CODE***
2005 PRINT"□□□LOADING CODE□□□"
2010 POKE780,1:POKE782,1
2015 POKE781,1:REM**CHANGE TO  [ POKE 781,0 ]  FOR DISK**
2020 SYS65466
2030 POKE780,14:POKE781,0:POKE782,192
2040 SYS65469
2050 POKE780,0:POKE781,0:POKE782,8
2060 SYS65493
2070 RETURN
3000 REM***SAVE CODE***
3005 PRINT"□□□SAVING CODE□□□"
3010 POKE780,1:POKE782,1
3015 POKE781,1:REM**CHANGE TO  [ POKE 781,0 ]  FOR DISK**
3020 SYS65466
3030 POKE780,13:POKE781,0:POKE782,192
3040 SYS65469
3050 POKE251,0:POKE252,8:POKE780,251
3060 POKE781,220:POKE782,123
3070 SYS65496
3080 RETURN
3090 REM***PUT DOWN FILE NAME IN MEM***
4000 N$="SPACE JUNK"
4010 FORN=1TOLEN(N$)
4020 POKE49151+N,ASC(MID$(N$,N,1))
4030 NEXT
4040 RETURN
```

```
0B58: 7EC3E1F9FF87C37E 582
0B60: 7EF3B199998DCF7E 52E
0B68: 7EDE999999999DB7E 516
0B70: 0000000000000000 000
0B78: 0000000000000000 000
0B80: 0000000000000000 000
0B88: 0000000000000000 000
0B90: 0000000000000000 000
0B98: 0000000000000000 000
0BA0: 0000000000000000 000
0BA8: 0000000000000000 000
0BB0: 1010101010101010 080
0BB8: 000000FF00000000 0FF
0BC0: 000000F01010101 130
0BC8: 0000001F1010101 05F
0BD0: 101010F000000000 120
0BD8: 1010101F00000000 04F
0BE0: 00663CFF3C660000 243
0BE8: 0000000000000000 000
0BF0: FF818181818181FF 504
0BF8: FFC3A59999A5C3FF 600
0C00: FF83312109193983 2B2
0C08: FFE787E7E7E7E781 68A
0C10: FF8339F9833F3901 3B0
0C18: FF8339F9C3F93983 52C
0C20: FF39393981F9F9F9 516
0C28: FF013F3F03F93983 336
0C30: FF83393F03393983 2F2
0C38: FF01F9F3E7CFCFCF 640
0C40: FF83393983393983 36C
0C48: FF83393981F93983 42A
0C50: 0F3FF0F0F0A0AA2A 492
0C58: C0F03C3C000000A0 34C
0C60: 0A0005050150500 0C4
0C68: A82814141404000 19C
0C70: FFFFF0F0F0A0AAAA 6C2
0C78: F0FC3C3C3C28A8A0 410
0C80: A0A0505050505000 2D0
0C88: 0F3FF0F0F0A0AAAA 512
0C90: C0F03C3C3C28A8A0 3DC
0C98: A0A0505050505000 2D0
0CA0: 2828141414141400 0B4
0CA8: 0F3FF0F0F0A0A0A0 4FE
0CB0: C0F03C3C00000000 22E
0CB8: A0A0505050150500 24F
0CC0: 000000141404000 2B8
0CC8: 3FFFF0F0F0A0AAAA 502
0CD0: F0FC0000000A0A0 32C
0CD8: A0A0505050551500 29F
0CE0: 0000000000545000 0A4
0CE8: 0F3F3F0F03000000 39C
0CF0: FFFFFFFF03020202 405
0CF8: FFFFFFFF2A0A0A0 5CC
0D00: F0FCFCF000000000 3D8
0D08: 0202010101010103 00C
0D10: A0A0505050050F0 3C0
0D18: 0303030302020202 014
0D20: F0F0F0F0A0A0A0A0 640
0D28: 2F1515151050100 084
0D30: 0201015555555500 158
0D38: A0505050504000 270
0D40: F0F0F0F0F0A0A0A0 690
0D48: 3C3C3C3C3C282828 1A4
0D50: A0A0505050551500 29A
0D58: 2828141414545000 130
0D60: F0F0F0FCFCAAAAAA 6C6
0D68: 3C3C3C3C3C2828A8 224
0D70: A2A2505050505000 2D4
0D78: A8A8545414141400 234
0D80: F0F0F0F0F0A2AAAA 6A6
0D88: 3C3C3C3C78A08000 288
0D90: AFA2505050505000 2DC
0D98: 50A0541414141400 1C4
0DA0: 0F3FF0F0FFFFF0F0 60C
0DA8: FFFF0000FFFF0000 3FC
0DB0: C0F03C3CFCFC3C3C 498
0DB8: F0F0F0F0F0F03F0F 5EE
0DC0: 0000000000000FFFF 1FE
0DC8: 3C3C3C3C3C3CF0C0 318
0DD0: FFFFF0F0FFFFF0F0 7BC
0DD8: FFFF0000FFFF0000 3FC
0DE0: C0F03C3CF0F03C3C 480
0DE8: 0F3FF0F0FFFFF0F0 60C
0DF0: FFFF0000FFFF0000 3FC
0DF8: C0F03C3CFCFC3C3C 498
0E00: 000000FFFF000000 1FE
0E08: FF83393901393939 2A0
0E10: FF03999983999903 3EC
0E18: FF83393F3F3F3983 334
0E20: FF03999999999903 402
0E28: FF813F3F033F3F81 300
0E30: FF813F3F033F3F3F 2BE
0E38: FF83393F21393983 310
0E40: FF3939390139393 256
0E48: FF03CFCFCFCFCF03 510
0E50: FF81E7E7E727278F 512
0E58: FF39393907333939 250
0E60: FF3F3F3F3F3F1F81 2DA
0E68: FF39110129393939 2.E
0E70: FF39190901213139 1E6
0E78: FF83393939393983 322
0E80: FF033939033F3F3F 234
0E88: FF83393939293983F9 3D2
0E90: FF03393903273339 20A
0E98: FF83393F83F93983 432
0EA0: FF03CFCFCFCFCFCF 5DC
0EA8: FF39393939393983 2D8
```

(listing 3 continued on next page)

(continued from page 46)

cassette is ready and then press "3". The code will now be saved.

Use cassette Y to save the object code until you have finished typing all of it in. Then you can save it after listing 1 on cassette Z. This should then give you a complete copy of Space Junk. It can now be loaded in the normal Shift and Run/Stop way, and hopefully it should load and run perfectly. ■

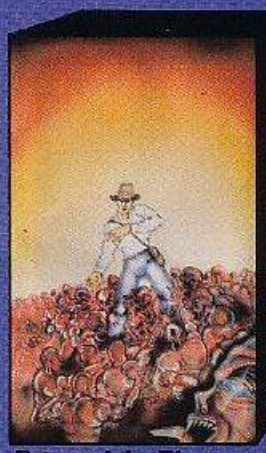
See next month's issue for the second part of Space Junk.

(listing 3 continued from previous page)

```
0EB0: FF39393939398307 366
0EB8: FF39393929011139 21E
0EC0: FF39118307831139 360
0EC8: FF39393981F93983 3E0
0ED0: FF0131E3C78F1901 384
0ED8: 0000000000000000 000
0EE0: 0000000000000000 000
0EE8: 0000000000000000 000
0EF0: 0000000000000000 000
0EF8: 0000000000000000 000
0F00: 0000000000000000 000
0F08: 0000000000000000 000
0F10: 0000000FFFFFFFFF 3FC
0F18: FF000000000000FF 0FF
0F20: 0000000000000FFF 0FF
0F28: C0C0C0C0C0C0C0C0 600
0F30: CCCC3333CCCC3333 3FC
0F38: 0303030303030303 018
0F40: 0000000CCCCC3333 1FE
0F48: FFFFFCFF0F0E0C080 701
0F50: 0303030303030303 018
0F58: 1818181F1F181818 0CE
0F60: 0000000F0F0F0F0F 03C
0F68: 1818181F1F000000 085
0F70: 000000F8F8181818 233
0F78: 0000000000000FFFF 1FE
0F80: 0000001F1F181818 085
0F88: 181818FFFF000000 245
0F90: 000000FFFF181818 245
0F98: 181818F8F8181818 280
0FA0: C0C0C0C0C0C0C0C0 600
0FA8: E0E0E0E0E0E0E0E0 700
0FB0: 10FF00FF00FF00FF 40C
0FB8: 00FF00FF00FF00FF 3FC
0FC0: 00FF00FF00FF00FF 3FC
0FC8: 00FF00FF00FF00FF 3FC
0FD0: 00FF00FF00FF00FF 3FC
0FD8: 00FF00FF00FF00FF 3FC
0FE0: 00FF00FF00FF00FF 3FC
0FE8: 00FF00DF00FF00FF 3DC
0FF0: 00FF00FF00FF00FF 3FC
0FF8: 00FF00FF00FF00FF 3FC
1000: 0000FFFFFF7C7C7C 471
1008: F8F8FFFFFFFFFFF8 7E3
1010: 3E3E3EFFFFFFFFFF 5B5
1018: 1FFFFFFFFFF1F1F 558
1020: 000000FFFF001818 22E
1028: 0000000800000000 008
1030: 0000001818000000 030
1038: FFFF3FF33F333FFF 4E0
1040: 00000F1007081013 051
1048: 000018CE0D00C04 28C
1050: 0007000F000F0007 02C
1058: 2080000000000080 100
1060: FFD7D7D7D7D7D7FF 708
1068: FFD7D7D7D7D7D7FF 708
1070: 1F1F000000000000 03E
1078: F8F8000000000000 1F0
1080: FFE8E8E8E8C0C0FF 71E
1088: FC0C0C0C0C0C0CFC 240
1090: FFFFCFFCFF3FFFF3 6F9
1098: FFF1FF3FFFE1FFFF 75C
10A0: FFE0FFFFFF07FFFF 6E1
10A8: 8181000000000000 102
10B0: 8181000000000000 102
10B8: 0000000FF000000 0FF
10C0: FF000000000000FF 1FE
10C8: FFFF000000000FF 2FD
10D0: FF818181818FF00 483
10D8: FF818181818FF00 483
10E0: 0000000000000000 000
10E8: 0000000000000000 000
10F0: 0000000000000000 000
10F8: 0000000000000000 000
1100: 0000FFFFFFF8F8F8 5E5
1108: F8F8F8FFFFFFFFFF 7E3
1110: 1F1F1FFFFFFFFFFF 558
1118: FFFFFFFFFF1F1F1F 558
1120: 0000007E7E001818 12C
1128: 0000000800000000 008
1130: 0000183C3C180000 0A8
1138: FFFF3FF33F333FFF 4E0
1140: 00000F1007081013 051
1148: 000018CE0D00C04 28C
1150: 0007000700070007 01C
1158: 0080008000800080 200
1160: FFD7D7D7D7D7FFFF 730
1168: FFFFD7D7D7D7D7FF 730
1170: 8F8F0000000C0000 11E
1178: F1F1000000000000 1E2
1180: FFCCCCE8E8E8E8FF 71E
1188: FC0C0C0C0C0C0CFC 240
1190: FFFFE77EFF9FFFF9 6F9
1198: FF7CFFE3FF78FFFF 6D2
11A0: FF1CFFFFFF8EFFFF 6F6
11A8: 0303000000000000 00E
11B0: C0C0000000000000 180
11B8: 0000000FF000000 0FF
11C0: FFFF0000000000FF 1FE
11C8: 00FFFFFF00000000 2FD
11D0: FFC1C1C1C1C1FF00 5C3
11D8: FF8383838383FF00 48D
11E0: 0000000000000000 000
11E8: 0000000000000000 000
11F0: 0000000000000000 000
11F8: 0000000000000000 000
1200: 0000FFFFFF1F1F1F 5D0
1208: FFF8F8F8FFFFFFFF 7E3
1210: 8F8F3FFFFFFFFFFF 6A8
1218: FFFFFFFF1F1F1FFF 558
1220: 0000303C3C001818 0A8
1228: 0000300800000000 008
1230: 0000301813000000 030
1238: FFFF3FF33F333FFF 4E0
1240: 00001E210F112027 0A6
1248: 0000304BC0B00808 1F8
1250: 0007000300030007 014
1258: 008000C000C00080 280
1260: FFD7D7D7D7FFD7FF 730
1268: FFD7FFD7D7D7D7FF 730
1270: C7C7000000000000 18E
1278: E3E3000000000000 1C6
1280: FFC0C0CACACACAFF 6A6
1288: FC0C0C0C0C0C0CFC 240
1290: FFFFF33FFFCFFFFC 6F9
1298: FF1FFFF8FF1CFFFF 630
1298: FF83FFFFFF1CFFFF 699
12A0: 0000000000000000 000
12A8: 0606000000000000 00C
12B0: 6060000000000000 0C0
12B8: 0000000000FF0000 0FF
12C0: 00FFFF0000000000 1FE
12C8: 000000FFFFFF0000 2FD
12D0: FFA1A1A1A1A1FF00 523
12D8: FF8585858585FF00 497
12E0: 0000000000000000 000
12E8: 0000000000000000 000
12F0: 0000000000000000 000
12F8: 0000000000000000 000
1300: 0000FFFFFFE3E3E3 5A6
1308: FFFFF8F8F8FFFFFF 7E3
1310: C7C7C7FFFFFFFFFF 750
1318: FFFFFF1F1F1FFFFF 558
1320: 0000001818001818 060
1328: 0000000800000000 008
1330: 0000183C3C180000 0A8
1338: FFFF3FF33F333FFF 4E0
1340: 00001C22270B1017 097
1348: 0000708BE010000 1E8
1350: 0007000300030007 014
1358: 008000C000C00080 280
1360: FFD7D7D7FFD7D7FF 730
1368: FFD7D7FFD7D7D7FF 730
1370: E3E3000000000000 1C6
1378: C7C7000000000000 18E
1380: FFC0C0C2C2C2C2FF 686
1388: FC0C0C8C8C8C8CFC 440
1390: FFFFF99FFFE7FF7E 6F9
1398: FFC7FF3FFF87FFFF 687
13A0: FF70FFFFFF83FFFF 6ED
13A8: 0C0C000000000000 018
13B0: 3030000000000000 060
13B8: 0000000000FF0000 0FF
13C0: 0000FFFF00000000 1FE
13C8: 0000000000FFFFFF 2FD
13D0: FF919191919FFF00 4D3
13D8: FF8989898989FF00 4AB
13E0: 0000000000000000 000
13E8: 0000000000000000 000
13F0: 0000000000000000 000
13F8: 0000000000000000 000
1400: 0000FFFFFFC7C7C7 552
1408: FFFFFFF8F8F8FFFF 7E3
1410: E3E3E3FFFFFFFFFF 7A4
1418: FFFF1F1F1FFFFFFF 558
1420: 0000001818001818 060
1428: 0000081C08000000 02C
1430: 0000001818000000 030
1438: FFFF3FFF3F3F3FFF 4F8
1440: 00001C22270B1017 097
1448: 0000708BE010000 1E8
1450: 0007000300030007 014
1458: 008000C000C00080 280
1460: FFD7D7FFD7D7D7FF 730
1468: FFD7D7D7FFD7D7FF 730
1470: F1F1000000000000 1E2
1478: 8F8F0000000000000 11E
1480: FFC0C0C0C0C0C0FF 67E
1488: FCACACACACACACFC 4C0
1490: FFFFFCCFFFF3FF3F 6F9
1498: FFF1FF8FFFE1FFFF 75C
14A0: FF0EFFFFFF70FFFF 678
14A8: 1818000000000000 030
14B0: 1818000000000000 030
14B8: 0000000000000FF00 0FF
14C0: 0000000FFFF000000 1FE
14C8: FFFF000000000FFF 2FD
14D0: FF8989898989FF00 4AB
14D8: FF919191919FFF00 4D3
14E0: 0000000000000000 000
14E8: 0000000000000000 000
14F0: 0000000000000000 000
14F8: 0000000000000000 000
1500: 0000FFFFFF8F8F8F 4AA
1508: FFFFFFFFF8F8F8FF 7E3
1510: F1F1F1FFFFFFFFFF 7CE
1518: FF1F1F1FFFFFFFFF 558
1520: 0000003C3C001818 0A8
1528: 0000081C08000000 02C
1530: 0000183C3C180000 0A8
1538: FFFF3FFF3F3F3FFF 4F8
1540: 00001E210F112027 0A6
1548: 0000304BC0B00808 1F8
1550: 0007000300030007 014
1558: 008000C000C00080 280
1560: FFD7FFD7D7D7D7FF 730
1568: FFD7D7D7D7FFD7FF 730
1570: F8F8000000000000 1F0
1578: 1F1F000000000000 03E
1580: FFC0C0C0C0C0C0FF 67E
1588: FCACACACACACACFC 4C0
1590: FFFFF7EE7FFF9FF9F 6F9
1598: FF7CFFE3FF78FFFF 6D2
15A0: FFC1FFFFFF8EFFFF 6C9
15A8: 3030000000000000 060
15B0: 0C0C000000000000 018
15B8: 0000000000FF0000 0FF
15C0: 0000000FFFF0000 1FE
15C8: 00FFFFFF00000000 2FD
15D0: FF8585858585FF00 497
15D8: FFA1A1A1A1A1FF00 523
15E0: 0000000000000000 000
15E8: 0000000000000000 000
15F0: 0000000000000000 000
15F8: 0000000000000000 000
1600: 0000FFFFFF1F1F1F 35A
1608: FFFFFFFFFFF8F8F8 7E3
1610: F8F8F8FFFFFFFFFF 7E3
1618: 1F1F1FFFFFFFFFFF 558
1620: 0000007E7E001818 12C
1628: 0000081C08000000 02C
1630: 0000001818000000 030
1638: FFFF3FFF3F3F3FFF 4F8
1640: 00001F1007001013 051
1648: 000018A4E0D80404 27C
1650: 0007000700070007 01C
1658: 0080008000800080 200
1660: FFFFD7D7D7D7D7FF 730
1668: FFD7D7D7D7D7FFFF 730
1670: 7C7C000000000000 0F8
1678: 3E3E000000000000 07C
1680: FFC2C2C2C2C2C0FF 686
1688: FC8C8C8C8C0C0CFC 440
1690: FFFF3FF3FFFCFFCF 6F9
1698: FF1FFFF8FF1CFFFF 630
16A0: FF38FFFFFFC1FFFF 6F3
16A8: 6060000000000000 0C0
16B0: 0606000000000000 00C
16B8: 0000000000000FF 0FF
16C0: 0000000000FFFF00 1FE
16C8: 000000FFFFFF0000 2FD
16D0: FF8383838383FF00 48D
16D8: FFC1C1C1C1C1FF00 5C3
16E0: 0000000000000000 000
16E8: 0000000000000000 000
16F0: 0000000000000000 000
16F8: 0000000000000000 000
1700: 0000FFFFFF3E3E3E 3B7
1708: F8FFFFFFFFFFF8F8 7E3
1710: 7C7C7CFFFFFFFFFF 66F
1718: 1F1FFFFFFFFFF1F 558
1720: 000000FFFF001818 22E
1728: 0000081C08000000 02C
1730: 0000183C3C180000 0A8
1738: FFFF3FFF3F3F3FFF 4F8
1740: 00000F1007081013 051
1748: 000018A4E0D80404 27C
1750: 0007000F000F0007 02C
1758: 0080000000000080 100
1760: FFD7D7D7D7D7D7FF 708
1768: FFD7D7D7D7D7D7FF 708
1770: 3E3E0000000000000 07C
1778: 7C7C0000000000000 0F8
1780: FFCACACACACACAFF 6A6
1788: FC0C0C0C0C0C0CFC 240
1790: FFFFF9FF9FF7FFFE7 6F9
1798: FFC7FF3FFF87FFFF 687
17A0: FF07FFFFFF33FFFF 639
17A8: C0C0000000000000 180
17B0: 0303000000000000 006
17B8: 0000000000000FF 0FF
17C0: 0000000000003FFFF 1FE
17C8: 0000000000FFFFFF 2FD
17D0: FF8181818181FF00 483
17D8: FF8181818181FF00 483
17E0: 0000000000000000 000
17E8: 0000000000000000 000
17F0: 0000000000000000 000
17F8: 0000000000000000 000
1800: 0D2020202020202020 0ED
1808: 2020202020202020 103
1810: 2020202020E5202020 1C5
1818: 2020202020202020E5 1C5
1820: 2033202020332020 126
1828: 2020202020202020 100
1830: 2020202020F2020 10F
1838: 202020D61B1E2225 1B5
1840: 1B1E22251B1E2225 100
1848: 1B1E22251B1E2225 100
1850: 1BD3202020E47F7F 330
1858: E4202020D6CDDDC4 473
1860: C7CACDDDC4C7CACD 650
1868: D0C4C7CACDDDC4C7 64D
1870: CACDDDD320202020 3BA
1878: D9E0E0E0E0E0E0E0 6F9
1880: E0E0E0E0E0E0E0D9 6F9
1888: 2020203220202020 112
1890: 20BA8D9020202032 259
1898: 20D2D5B5EA202020 336
18A0: 2020202020202020 100
18A8: 9920202020202020 179
18B0: 2020202020992020 179
18B8: 20E5202020939620 2AE
18C0: 2020202020202020 100
18C8: 9920202020992020 1F2
18D0: 2020203220202038 18A
18D8: 9720202020202020 177
18E0: 2020202020202020 100
18E8: E4202020202020 1C4
18F0: 2020202020202020 100
18F8: 2020202020202020 100
1900: 0E2020207F202020 14D
1908: 7D7A7E2020202020 215
1910: 20D9E0E0E0E0E0E0 639
1918: E0E0D920202020A20 34B
1920: 2034363836342020 16C
1928: 282A2020202020202020 112
1930: 2020202020303138 1E9
1938: E920D7261C1F2326 28A
```

the only choice

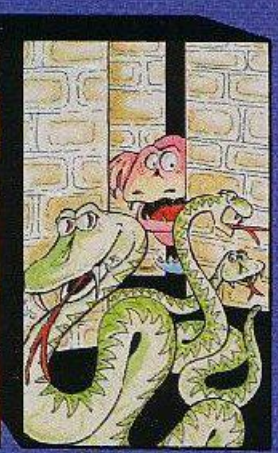
Kuma MSX

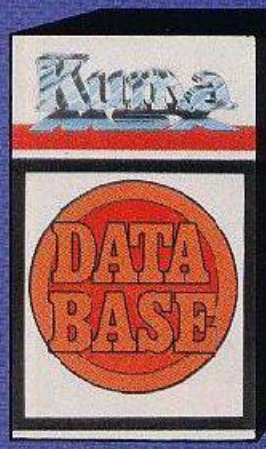

Eric and the Floaters

Binary Land

Driller Tank

Fire Rescue

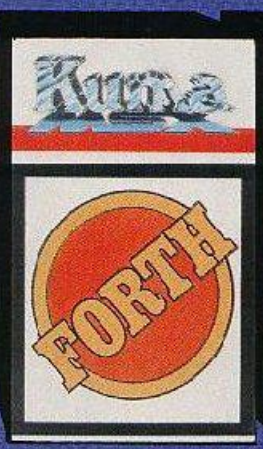

Hyper Viper



Database

ZEN Assembler

WDPRO



Kuma FORTH

Home Budget

An outstanding selection from Kuma's rapidly expanding range of Entertainment and Application Software for the MSX Micro-computer.

BOOKS ● ***Starting with the MSX*** ● ***The MSX Red Book*** ● ***Starting Machine Code with the MSX*** ● ***Behind the Screens of the MSX***

ACCESSORIES ● ***RS232C Interface*** ● ***Speech Synthesiser*** ● ***Parallel Interface.***

NEW TITLES* ● ***Star Avenger* ● ***Superchess*** ● ***Stop the Express*** ● ***Ninja*** ● ***Mean Streets*** ● ***Logo Turtle-graphics.***

Now available from larger branches of Boots and selected branches of Co-op, Granada, Laskys and John Menzies

Kuma Computers Ltd., Unit 12, Horseshoe Park, Horseshoe Road, Pangbourne, Berks RG8 7JW.

Please send full catalogue on MSX products.

Name .....

Address .....

..... Phone .....

I own a ..... MSX Computer.

**Visitors wishing to call at our Pangbourne Manufacturing and Distribution Centre are advised to phone 07357-4335 first for an early appointment. Trade enquiries welcome.*

REWRITE HISTORY THIS WEEKEND!

All action strategy games from SSI - the world's No.1 war game company

64 ATARI

Spectrum versions available soon!

At last here is your chance to see how you shape up as a General in a real battle. The pages of history record the triumphs and failures as Eisenhower, Montgomery, Rommel and Von Rundstedt battled in Europe and North Africa. But with a clear thinking strategist like yourself in command perhaps the historians would have had a different story to write!

U.S. Gold is proud to present four of the best strategy games by Strategic Simulations Incorporated:

KNIGHTS OF THE DESERT pitches the British Forces of Montgomery against the might of Rommel and his Panzer Divisions in the classic North African campaign of 1941.

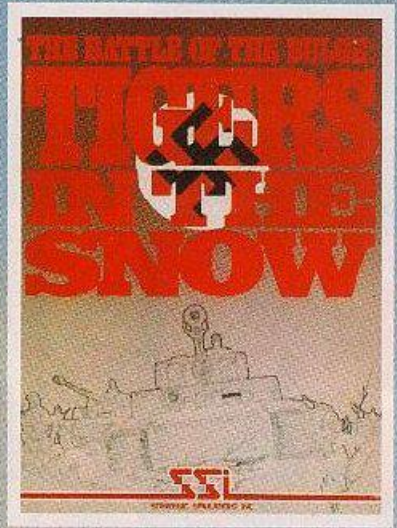
BATTLE FOR NORMANDY commences on 'D-Day' June 6th 1944 and relives the Allied Forces attempt to smash Hitler's Atlantic Wall.

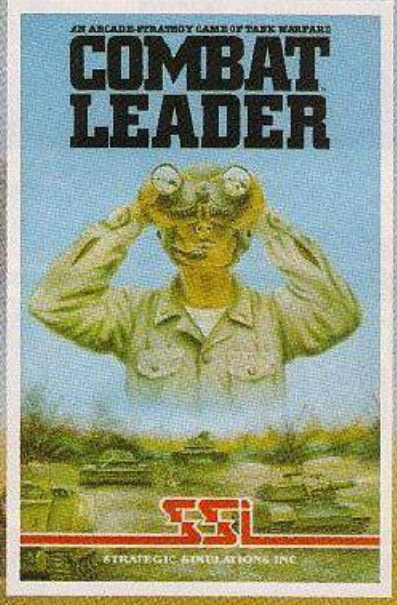
TIGERS IN THE SNOW reconstructs the legendary Battle of the Bulge as in December 1944 the Panzer Divisions of Von Rundstedt try one last gamble in a desperate attempt to halt Eisenhower's advancing Allied lines.

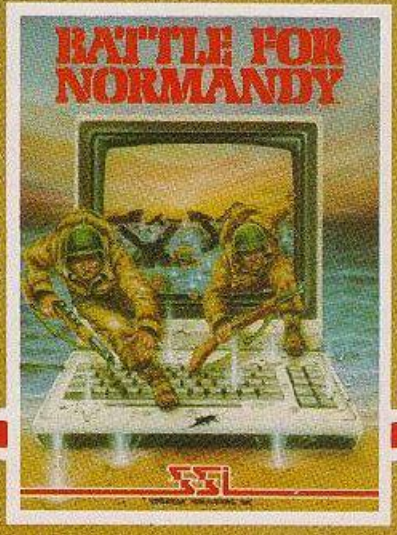
Who will be the victor and who the vanquished?

Only you have the answers!

And if you're looking for strategy with arcade action then COMBAT LEADER will test all your wits, depth of thought and reflexes in this toughest of battle challenges!







£14.95

disk & cassette

U.S. GOLD

All American Software

THE ULTIMATE IN AMERICAN SOFTWARE FOR YOU ON U.S. GOLD

U.S. Gold is stocked by all leading computer stores including:

BOOTS WHSMITH JOHN MENZIES WILDINGS WOOLWORTH

DEALERS! For information on how to become a U.S. Gold Stockist write to: CentreSoft Ltd., Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Telephone: 021-359 3020.

SSI

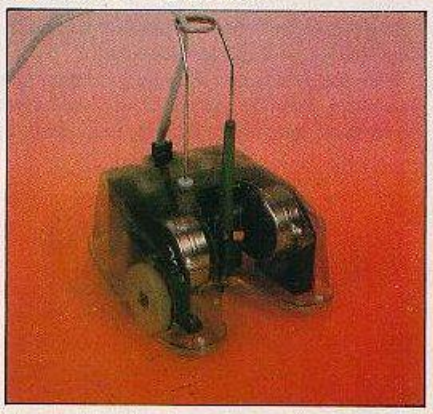
STRATEGIC SIMULATIONS INC.

DESIGN A ROBOT

Competition

WIN Maplin's fabulous Hero Jr — the £1,100 literally all-singing, all-dancing robot.

Here's the chance to design the robot of your dreams — or nightmares. What we would like you to do to win a £1,100 Hero Jr or Zero II is to send us designs for your ideal robot. You can submit rough sketches, drawings or fully documented designs. Your robot could be for domestic, computer, medical or industrial use — or any other applications you can think of. We shall be publishing the best of the bunch in June.



PLUS

Two Maplin's Zero II mini-turtles for the runners-up.

RULES

- The winners of the competition will be the people who, in the view of the editor, come up with the most useful, original or witty designs for a new robot.
- The names of the winners will be printed in the June issue of *Your Computer*.
- All entries must arrive at the *Your Computer* offices by the last working day in March 1985.
- Each person may enter the competition only once.
- Entries to the competition cannot be acknowledged.
- No employees of Business Press International or their relatives may enter the competition.
- The decision of the editor is final.
- No correspondence on the result of the competition will be entered into.
- Businss Press International assumes no responsibility or liability for any complaints arising from this competition.

YOUR COMPUTER COMPETITION

Don't forget to enclose this coupon, or a photocopy of it when you send us your robot design.

Your robot's name _____

Name _____

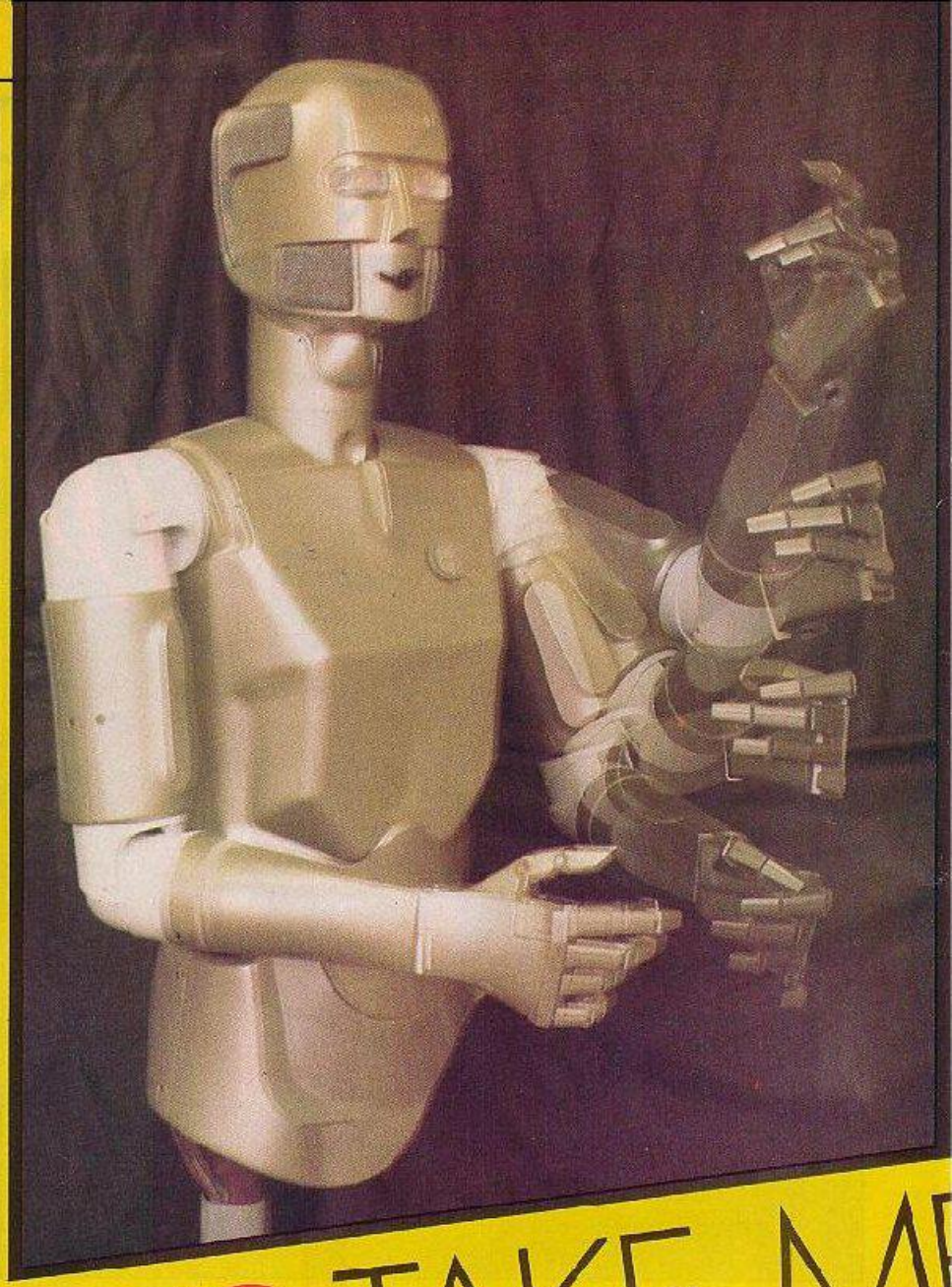
Address _____

_____

_____

ROBOTS TAKE M

Nigel Clark shows you how to join the robot revolution for as little as £10 or as much as £1,000.



FOLLOWING IN THE footsteps of the micro revolution another branch of high technology is preparing to invade the home — personal robots.

There are growing numbers of people on both sides of the Atlantic who believe that a BBC B should never be seen without its Buggy or Beasty arm, that the best use for an Apple IIc is to control Topo or that a ZX-81 is useless without a Hebot II.

It is often said that the personal robot market is at the same stage as the personal computer market was six years ago. It would be a mistake, however, to assume that it will follow the same growth path.

Computers are a relatively recent development and people have had little time to get fixed ideas about how they should look and of what they should be capable. Robots have existed in people's imaginations for centuries as humanoids who can do all these menial tasks we would rather not do. Anything that does not meet those requirements is seen as a failure.

Two American companies tried to meet the specifications halfway. Androbot built Topo which was imported into Britain for a short time by Prism Microproducts, costing £1,549.95, and RB Robots built the RB5X.

Both were capable of movement and speech and the RB5X was able to detect obstacles and avoid them. Both companies have had to apply for the American version of receivership.

The experience has not deterred them though. Both are still trading and Androbot has released another robot and another more complex version of Topo is due soon.

And one American company has been quite successful. Heathkit makes Hero 1 and Hero Jr and both are sold in Britain, in kit form by Maplin Electronic Supplies and ready built by Zenith Data Systems.

Heathkit followed a different course to the others by emphasising the educational aspects of Hero rather than the fun robot image of the others. Costing about £1,600 in kit and £2,500 ready-built, Hero provides a single arm and single wheel driving system and the ability to control these in response to its five senses.

Hero Jr was launched towards the end of last year. It is being sold as a companion robot which can speak, sing, recite poetry and guard the house. All this comes for a price of £1,100.

While America was following the highly expensive personal robot route British developers saw a different way — one that has proved more successful and given us a world lead.

Robots as computer peripherals can add a further dimension to computer-based education. Instead of writing a program and only seeing the results displayed on the screen it is possible now to see the physical effects by way of an arm or turtle.

Courses on robotics

Arms come in a variety of forms and complexities. As a good guide it is usually the case that you get what you pay for, but it is possible to get some quite sophisticated equipment at a relatively low price.

The Beasty Arm from Commotion costs only £39.95 for which you get three axes of movement and a hook for picking up things. At the other end of the personal robot scale about £3,200 will buy the Open University Robot made by TecQuipment.

It is being used by the Open University as the basis for two courses in robotics and had to meet an exacting specification. It has six axes, a gripper, can lift 1kg and is said to be accurate to 3mm. In between there are a growing number and variety of arms.

Although the uses to which arms can be put are the same, there are different ways in which the same effect can be achieved. The more axes an arm has the more complicated movements it can perform.

The Beasty Arm can only rotate its base and move the two sections of the arm up and down. The TecQuipment MA2000 can also do that as well as having a wrist on the gripper which can rotate, pitch and yaw.

Five axes are more usual, however, with the wrist only having the ability to rotate and move up and down — examples are the Armdroid from Colne Robotics, the Genesis series from Powertran Cybernetics and the Atlas from LJ Electronics.

There are almost 20 arms on the market in Britain, the majority of which are British

"Do the washing up, hit the kids, strangle the cat" — that's the sort of robot promised by most of the automaton manufacturers riding on the back of the micro boom according to Jon Barron of McAndroids.

When he isn't making parts for old Harley Davidsons or inventing special effects for film and TV like a ten foot treadmill for a Bronski Beat video, Jon builds androids like the one on the left. Together with sculptors Alan Dun and Richard Glassborow and an electronics engineer, Jon's been in the McAndroids business for a year.

The first McAndroid is 5ft 7in tall because "a very big figure is threatening" and the McAs are trying to make robots friendly. The androids are built out of glass fibre and chromed epoxy resin joints, powered by model aircraft servo motors connected to a new patented valve design, and controlled by a Zilog controller board.

The McAndroids are way beyond the price bracket of even expensive robots like the Heros but the ideas that the team are working on now could be used for cheap units which would plug into a home computer. At times Alan is amazed at how slow the outside world has been in catching up with developments in robotics — Yellow Pages still refuses to open up a category for robots "it took them seven years to get round to videos".

developments.

Movement is usually provided by stepper motors or servos and can be controlled by a variety of micros with the BBC B being the most popular.

The area in which they tend to differ is in the drive mechanisms. Most use a transmission system to take the power from the motor to the joint with varying degrees of sophistication. The Armdroid, costing about £500, uses non-stretch nylon cords, the Atlas, at £1,950, has a toothed belt and the latest machine from Cybernetics Applications, Neptune, £1,250, uses hydraulics Pneumatic systems are being assessed by other companies.

Accuracy and cost are the two factors to be taken into account when deciding on the transmission system. Hydraulic and pneumatic systems are usually more accurate than cord or belt systems but they are also more expensive. LJ Electronics however has achieved a high degree of accuracy with the belts on its Atlas.

All the manufacturers see education as their major market with small, light industrial uses coming second and home sales a poor third. This is probably due to the lack of software. What is available is usually concerned with putting the arms through their paces and simulating the larger arms to be found on the production lines.

Cyber Robotics has launched a package which illustrates that. Most of the programs for the Cyber 310 simulated other types of arm, although it did contain a program which solved the Towers of Hanoi puzzle.

It is a market which is profitable for many small companies and there is a growing number of them seeking to enter.

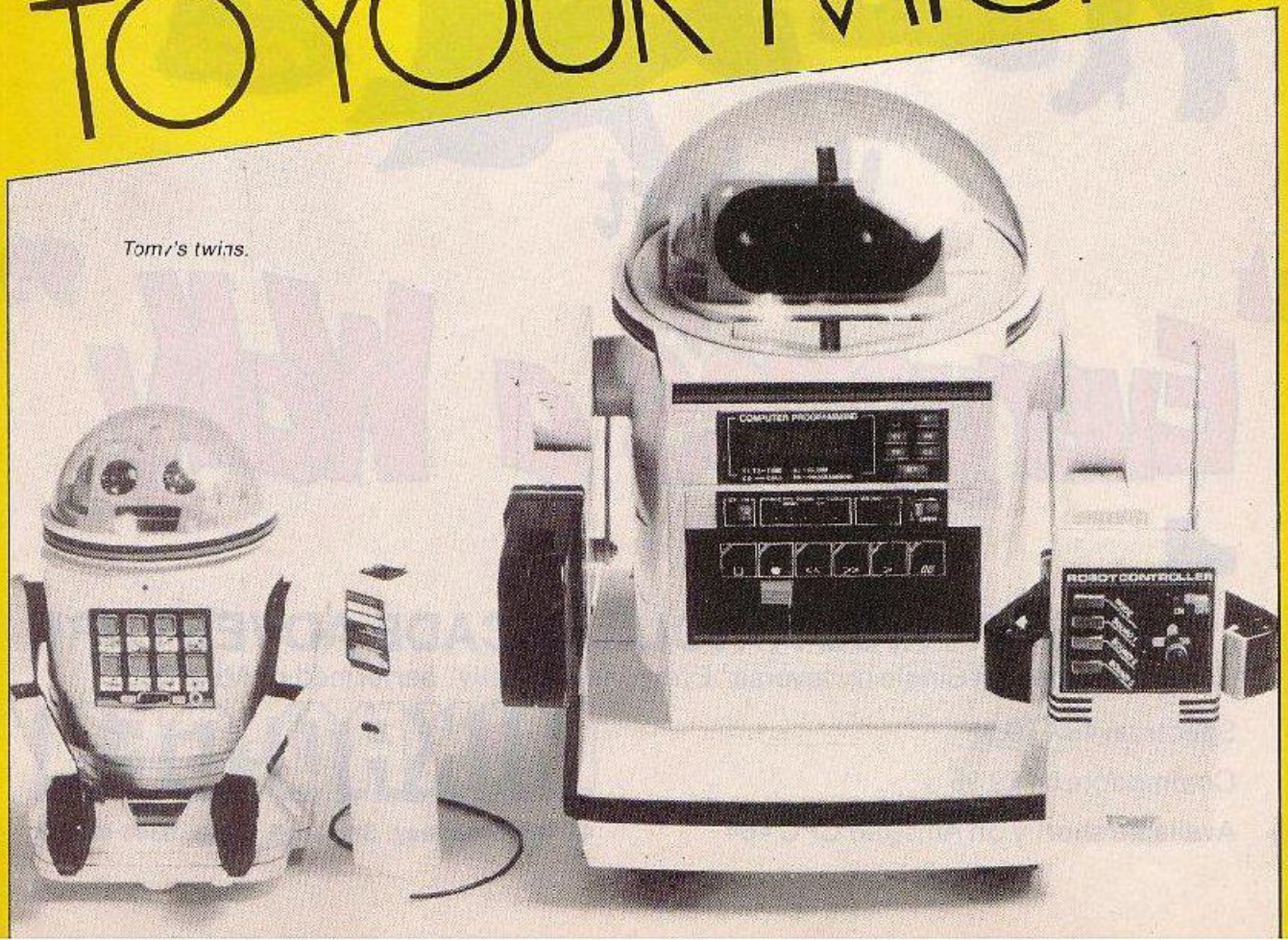
Whereas arms are mainly used as smaller versions of industrial equipment, turtles were developed to expand children's ability to learn. They are based on the theories of Seymour Papert, who wrote Logo as a high level educational language. One of its capabilities was to allow children, using simple commands, to control a character on the screen known as a turtle.

From that were developed peripherals called turtles which were mobile devices with a pen attached which could draw designs under the control of the compouter. They were similar to plotters but with far greater freedom of movement.

(continued on page 55)

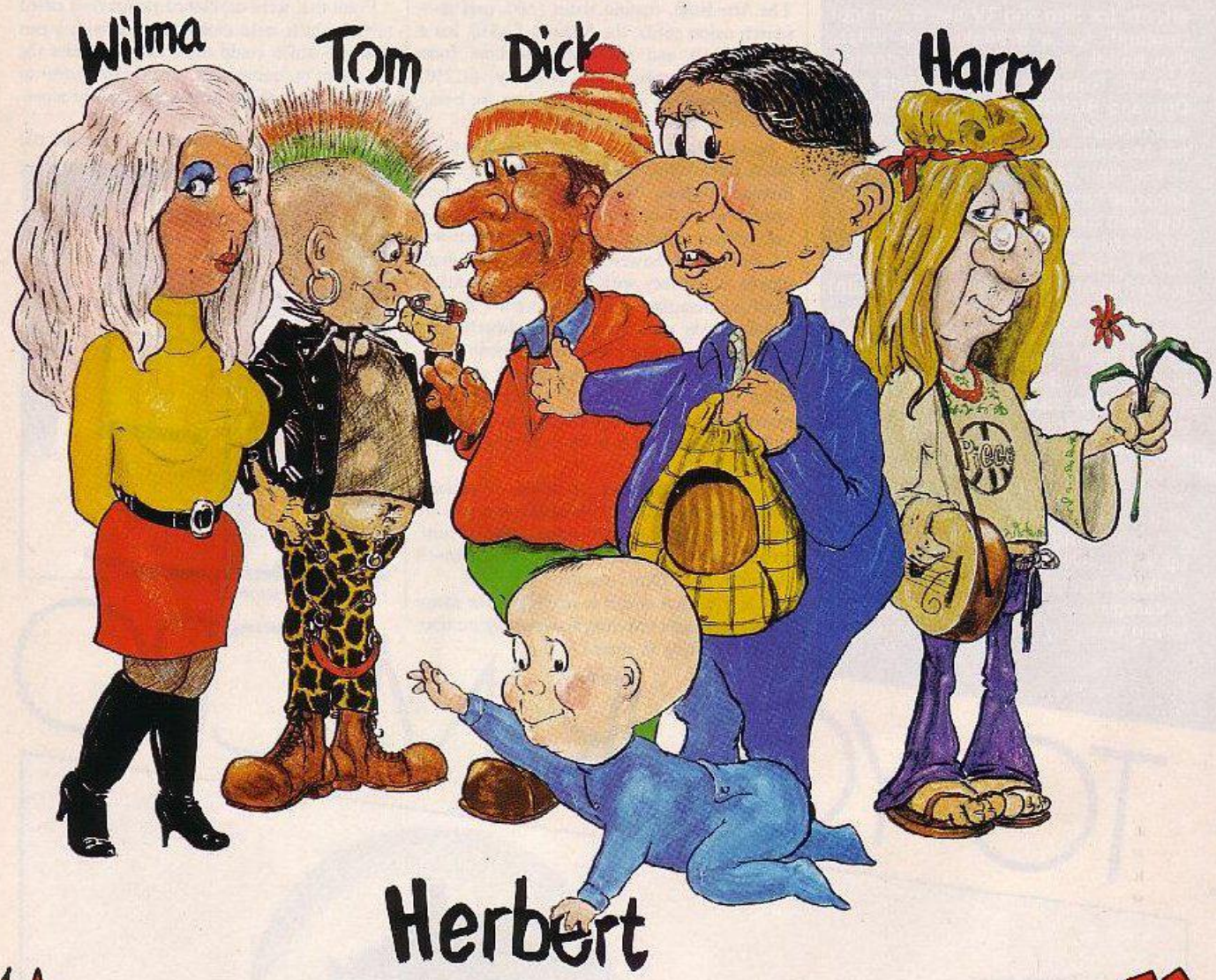
Hero — see page 51.

E TO YOUR MICRO



Tomy's twins.

Meet the Gang!



"Everyone's a Wally"

1ST EVER MULTI-ROLE ARCADE ADVENTURE

Includes Hit Single on reverse "Everyone's A Wally" performed by Mike Berry

Spectrum 48K £9.95

Commodore 64 £9.95

Available shortly on Amstrad CPC 464

MIKRO-GEN

44 The Broadway, Bracknell, Berks. 0344 427317

(continued from page 53)

There are four British turtles on the market with the addition of the Penman plotter which is designed similar to a turtle and can be used as one.

The most traditional is the Jessop or Edinburgh turtle. Looking like an upturned mixing bowl with two drive wheels and a pen holder inside it closely resembles the original design. It can be controlled from most of the popular micros via an umbilical cord.

Hebot II from Powertran is a similar design but only available in kit. The most famous at the moment is probably the BBC Buggy due to its appearances on television in the series *Making the Most of the Micro*. Like Hebot it is less to do with the encouraging of different forms of education than with teaching people about computer control and robotic sensing.

Valiant Designs has gone for the same Papert route as the Jessop and the company's Valiant can be controlled by the various dialects of Logo which are available for the usual micros. It is the only one which has been designed to look like a turtle although it has the same basic two-wheel drive and retractable pen holder of the others.

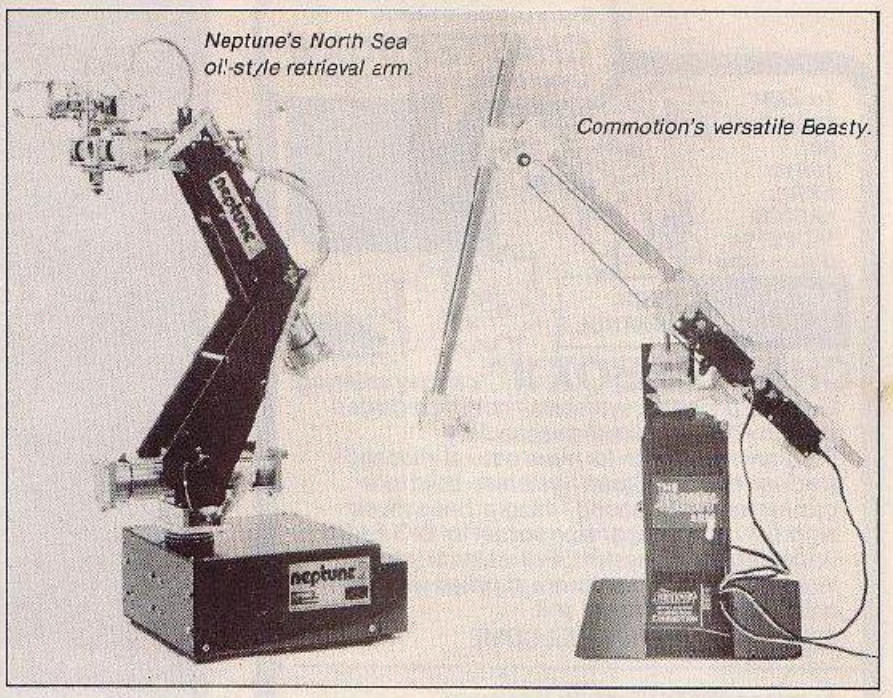
Little applications software

It is expected that these will be joined by other versions later this year. The Zeaker, which worked with a ZX-81 and was sold by Colne Robotics, is being redesigned by IGR and should be on sale soon. From the United States there is news that Androbot has finally got fired into production and looking at the possibility of sending some to Britain.

In common with the arms there is little applications software available for the turtles. One of the exciting prospects for 1985 is the launch of Trekker and a suite of 30 programs. It has been developed by a secondary school in North Wales and is being produced in conjunction with the ITV program, *The Micro at Work*. The software covers a whole range of applications in maths and robotics.

One area that has not as yet concerned British manufacturers is toys. That has been left to the Japanese and Americans. They have not produced anything which is very complicated but they are cheap and have some approximation to robots.

One of the first was the Big Trak from Milton Bradley. It is a large tank-like vehicle which has a keypad on its top which is used to give directions and costs £60. A similar product was launched last year. It is called George the Computrobot and costs just under £25.



Neptune's North Sea oil-style retrieval arm.

Commotion's versatile Beasty.

Tomy Toys aimed for the Christmas market with the launch of three new robots in November. They have been producing a toy arm, the Armatron for some time and now have the Dingbot at £5.99, the Verbot at £39.95 and the Omnibot at £149.95.

The success of last year though was probably the Movits. Imported from Japan they ranged in price from £9.99 to £34.99. The most expensive was a simple turtle which could be programmed using a small controller. There are now interfaces available which allow it to be connected to a Spectrum. A further robot, the Wizerd, has recently been added to the range.

There is undoubtedly a great deal of interest in robots. They can be guaranteed to attract a crowd wherever they go and a number of companies use them in promotional work. They are only radio-controlled models but they fit people's views of what robots should look like, views which have been conditioned by fiction such as *Star Wars* or the *Hitchhikers Guide to the Galaxy*.

Those views are being further developed by people such as Jim Whiting whose wonderful mobile sculptures, controlled by a Spectrum, never fail to astonish large numbers of people.

Reality is more mundane. The arms, turtles and toys represent the limits of what can be achieved in personal robots at the moment. While they perform a useful function, particularly in education, they fall far short of the expectations of the general public.

There are problems in meeting these expectations which are concerned with information gathering and processing. Walking across a room avoiding obstacles such as tables and chairs is beyond the capabilities of any robot which could be produced at a cost which would make it attractive for use in the home.

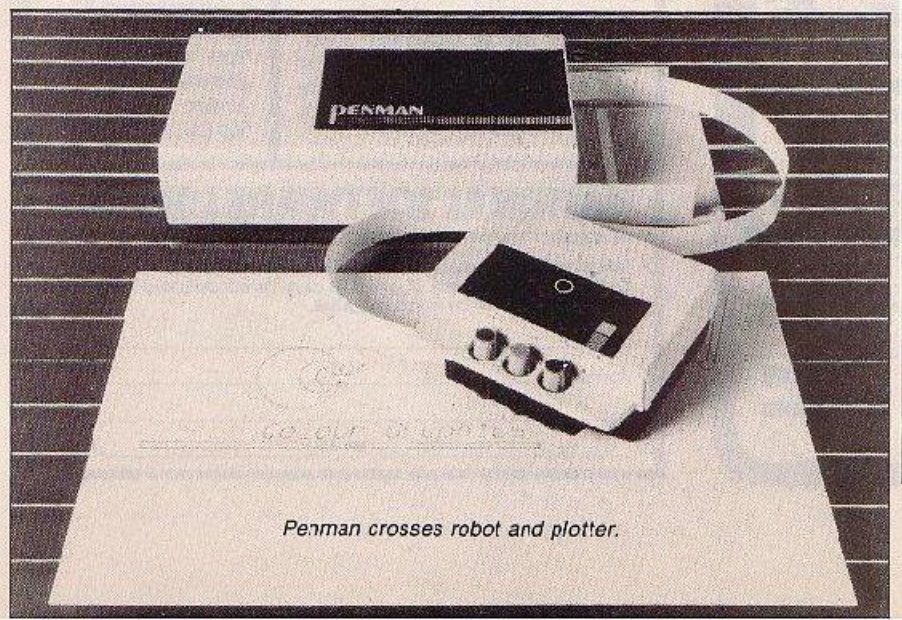
The robot needs to have senses such as touch or sight to locate the obstacles and then intelligence to react in such a way that it makes progress across the room. A fairly simple device could avoid the obstacles but would react like a pinball machine without any guarantee that it would reach its goal.

The Robat competition

To help it decide which way to move it would need to store in memory the overall direction in which it should be going and detailed description of all the obstacles it may meet on the way. For example, if it came across the settee it would need to know where it had hit the settee by comparing the information it could gather with that in its memory so it would know to alter course to ensure getting round the settee in the simplest way. Anything more complex and a huge memory would be needed with some form of artificial intelligence to sort through it.

There is no lack of enthusiasm for tackling these difficulties. John Billingsley of Portsmouth Polytechnic, who began the micromouse contests, has now launched a new problem — the Robat competition. The aim is to create a machine which can play a form of robot table tennis.

There has been a huge amount of interest throughout the world and prototypes are already taking shape. Solutions found in this contest might provide the basis for more commercial applications later. ■



Penman crosses robot and plotter.

Every computer needs
CHATTERBOX II
"Listen creep, I am the leader...."

For ZX81
SPECTRUM
BBC
TRS 80
APPLE
NASCOM
VIC/PET 64
(Please state)

NEW! EXCLUSIVE! **PITCH CONTROL**

CHATTERBOX II™ can say anything!

Genuine phoneme synthesis - not just recorded speech - hence unlimited vocabulary
Programmable pitch for more natural intonation (exclusive to Wm Stuart Systems) - solid tone cabinet for quality sound - integral beep/music amplifier. **PLUS** expansion socket for BIG EARS voice recognition system. Full instructions technical notes and software supplied with this outstanding educational unit.
DEALER ENQUIRIES WELCOME

As seen on BBC TV "Computer Programme"

BIG EARS

SPEECH INPUT FOR ANY COMPUTER

Hugely successful Speech Recognition System
complete with microphone, software and full instructions.
BUILT TESTED & GUARANTEED
PLEASE STATE COMPUTER: UK101, SPECTRUM, ATOM, NASCOM2, Vic 20, Micron, ZX80/81, PET, TRS80, MZ80K, APPLE II, BBC MICRO, CBM 64

ONLY £49

ZX81/SPECTRUM

NEW! VIBRATO CONTROL

MUSIC SYNTHESISER (Stereo) + 16 LINE CONTROL PORT

Play 3-part music, sound effects, drums etc. Full control of attack, decay and frequency. Input/Output lines provide control and monitor facility for Home Security, Robot Control, Model Railway etc. etc. Works with or without 16K RAM.

Full instructions software included.
Add keyboard to make a live performance polyphonic synthesiser!
Note: up to 3 units can be used simultaneously: giving 9 music channels & 48 I/O lines

AMAZING VALUE AT ONLY
£19.50 (KIT)
£25.50 (BUILT)

SOFTWARE

THE COMPOSER
Synthesiser Music Programme
Enter & play 3 part harmony
Includes demonstrations
(Spectrum ZX81) **recommended £7**

TALKING HANGMAN
For Chatterbox!
The classic game claims its victims with a dry vocal accompaniment (Spectrum) **£6**

ZX ARP/DRUMSEQ
Fascinating synthesiser demonstrations. Generates automatic sequences and plays from keyboard. Some weird effects (Spectrum) **£6**

CHROMACODE??????
Can you defuse the bomb by cracking the secret combination before time runs out? With Chatterbox voice output (Spectrum) **£6**

COLOUR MODULATOR KIT £16
RGB in, PAL UHF out (not for ZX) BUILT £22

Please add VAT at 15% to prices
Barclay/Access orders accepted by telephone
All enquiries S.A.E. please

WILLIAM STUART SYSTEMS Ltd
Quarley Down House
Croidenon
Nr Salisbury
Wiltshire. SP4 0DZ
Tel: 093 064 235

SPECTRUM
RAINBOW COPIA

★QUITE SIMPLY THE BEST BACK-UP COPIER EVER FOR THE SINCLAIR SPECTRUM
★ALMOST ANY PROGRAM IS REPRODUCED ON BLANK TAPES
★TESTED ON OVER 100 TOP GAMES WITH A 98% SUCCESS RATE
★MULTIPLE PART PROGRAMS BACKED UP IN ONE GO
★ALSO BACKS-UP HEADER LESS PROGRAMS
★FULL INSTRUCTIONS WITH THIS EASY TO USE PROGRAM
★THIS INCREDIBLE MACHINE CODE PROGRAM IS EXCELLENT VALUE @ £5.95 incl. P&P

★ ★ ★ ★ ★ ★ ★

COMMODORE 64
BRING YOUR 64 TO LIFE WITH.....
LIGHTNING LOAD

★CONVERTS ALMOST ALL YOUR FAVOURITE SOFTWARE & GAMES INOT A SUPERFAST LOADING VERSION
★YOUR CASSETTE PROGRAMS WILL INDEPENDENTLY LOAD FASTER THAN THE COMMODORE DISC DRIVE!!
★LIGHTNING LOAD HAS SOPHISTICATED FEATURES WHICH LEAVE OUR COMPETITORS LIGHT YEARS BEHIND
★COLOUR & SOUND ARE USED IN SPECTACULAR & UNIQUE WAYS TO ENHANCE THE PROGRAM
★100% MACHINE CODE, FLEXIBLE MENU SYSTEM ALLOWS SAVING OF MORE THAN 48K CONTINUOUS RAM
★THIS AMAZING PROGRAM IS NOW ON SPECIAL OFFER £7.95 NOW £6.95 incl. P&P

★ ★ ★ ★ ★ ★ ★

COPYCAT
THE ULTIMATE BACK-UP TAPE COPIER

★MAKES BACK-UP COPIES OF ALMOST ALL SOFTWARE
★SPECTACULAR MULTICOLOURED LOAD AND SAVE
★WIZARD AUDIO SOUND EFFECTS
★CASSETTE MAGIC SENSE
★100% MACHINE CODE TAPE COPIER WITH FULL INSTRUCTIONS
★CAN YOU FIND A BETTER COPIER? — WE CAN'T!
★SUPERB VALUE AT £5.95 inc. P&P

DISPATCH OF THESE PROFESSIONAL PROGRAMS WITHIN 24 HOURS!
CHEQUES/P.O.'s TO:

WIZARD SOFTWARE (Dept. YC)
59 THE MARLES, EXMOUTH, DEVON EX8 4NE

HIRE SPECTRUM SOFTWARE

OVER 280 different tapes for hire including **ARCADE, ADVENTURE, BUSINESS, EDUCATIONAL**, etc. – even an m/c Compiler. **FREE** 26 page catalogue. **FREE** newsletter, with hints, tips and our top tape chart.
OVER 3000 tapes in stock, with up to 60 copies of each title for fast service. All tapes sent by 1st class post.
LOWEST PRICES – hire up to 3 tapes at a time, from 63p each for two weeks hire. (Plus p&p and VAT). European members welcome.
Tapes for sale at DISCOUNT prices.
Telephone 01-661 9240 (9am - 5pm) or write for further details, or complete the coupon and **JOIN TODAY** – you've nothing to lose!

SAVE £3.00!!

For a limited period, we are offering **HALF-PRICE** membership to readers of this magazine. Join now, **LIFE** membership is only £3.00 (normally £6.00).

SWOP SHOP

A new service from N.S.L. **SWOP** your unwanted tapes with tapes from other members for a small handling charge of only 60p (plus p&p and VAT)

NATIONAL SOFTWARE LIBRARY

42 Harefield Avenue, Cheam, Surrey SM2 7NE.

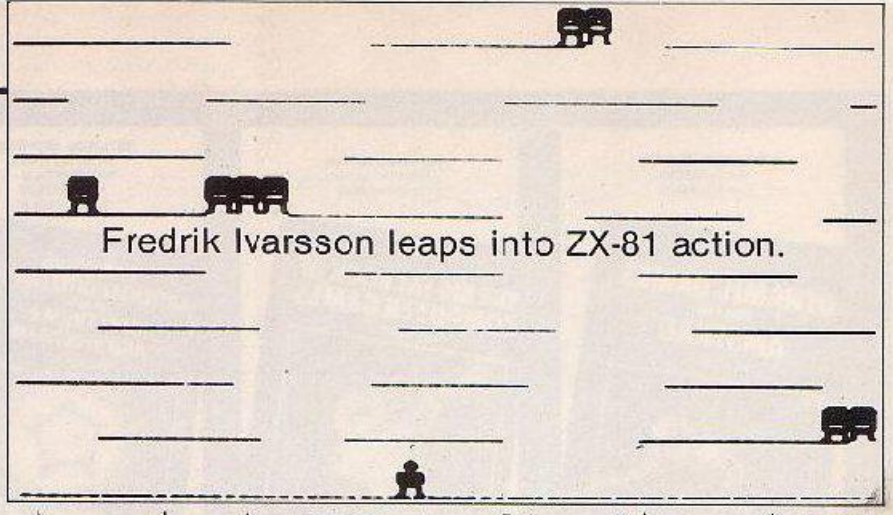
I enclose cheque/postal order for £3.00 for LIFE membership. Please rush my membership kit to me. If, within 28 days, I'm not delighted with your service you'll refund my membership fee.

Name _____

Address _____

_____

YC3



Fredrik Ivarsson leaps into ZX-81 action.

MAD JUMP

A FRIEND OF MINE had an Oric program in the September issue of *Your Computer*. I have invented a similar game for the ZX-81 16K. You move Matt on platforms and try to jump up to the top of the screen but watch out for the monsters. If you are on the second platform and fall down to the first platform you will die. You score 10 points every time you jump and, if you reach the top, 500 points in bonus.

Now, to enter the program, first set Ramtop to 26368 by typing:

```
POKE 16389,103          N/L
NEW                     N/L
```

Now make a 946 bytes long Rem statement by making line 1 to 10 89 characters. Then Poke as direct commands:

```
POKE 16514,118
POKE 16515,118
POKE 16511,178
POKE 16512,3
POKE 16510,0
```

You will now have an empty Rem statement. Now enter the hexloader in listing 1. If you don't want to see line 0 every time you enter a line you can type:

```
LIST 1
POKE 16419,1
```

Run the hexloader and type in all the machine code in listing 2. When that is ready, delete the hexloader and enter the Basic program in listing 3. When you have done that save the program by typing: GOTO 450 ■

Listing 1.

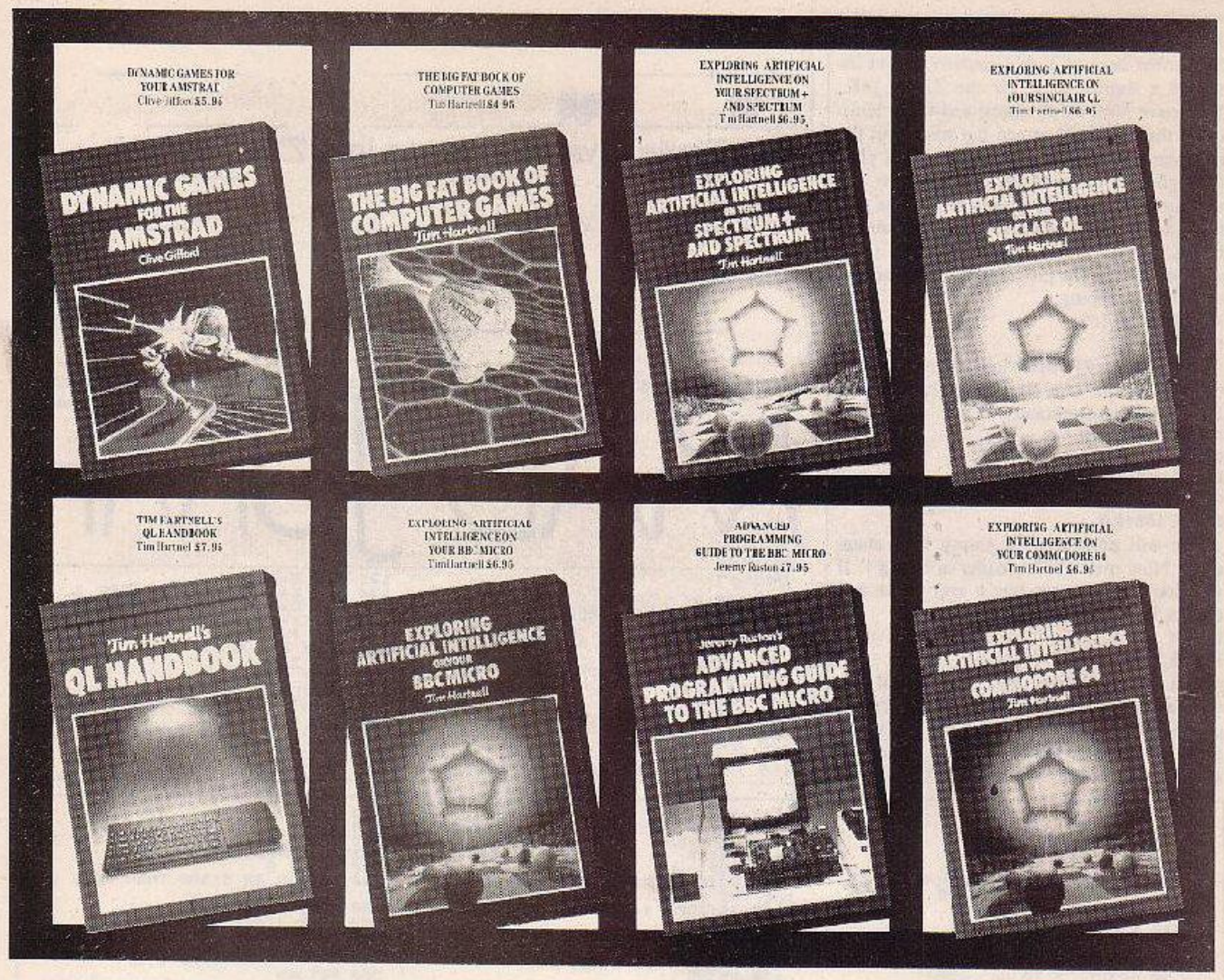
```
  5 REM HEXLOADER
 10 PRINT "START ADDRESS"
 20 INPUT S
 30 PRINT "FINISH ADDRESS"
 40 INPUT F
 50 FOR N=S TO F STEP 8
 60 LET Z=0
 70 PRINT N;": ";
 80 INPUT A$
 90 PRINT A$;" = ";
100 INPUT TOT
110 PRINT TOT
115 IF PEEK 16422=2 THEN SCROLL
120 LET Z=0
130 FOR K=1 TO LEN A$ STEP 2
140 LET C=(CODE A$(K)-28)*16+CO
DE A$(K+1)-28
150 LET T=T+C
160 POKE N+Z,C
170 LET Z=Z+1
180 NEXT K
190 IF TOT=T THEN GOTO 220
200 PRINT "ERROR - PLEASE INPUT
AGAIN"
205 IF PEEK 16442=2 THEN SCROLL
210 GOTO 60
220 NEXT N
```

Listing 2.

```
  2 LET HI=100
  3 LET A$="ZX81"
  4 CLS
  5 LET L=5
 10 PRINT TAB 10;"MADJUMP II"
 20 PRINT AT 21,0;"MADE BY FRED
RIK IVARSSON"
 25 GOSUB 300
 30 PRINT AT 2,0;"Z TO V : MOVE
 LEFT"
 40 PRINT "B TO £ : MOVE RIGHT"
 50 PRINT "M TO NL: JUMP"
 60 PRINT
 70 PRINT "PRESS ANY KEY TO STA
RT THE GAME"
 80 IF INKEY$="" THEN GOTO 80
 85 CLS
 90 RAND USR 17383
100 PRINT TAB 10;"MADJUMP II"
102 PRINT AT 21,0;"MADE BY FRED
RIK IVARSSON"
103 PRINT AT 1,0;
110 PRINT
115 IF L=1 THEN GOTO 210
120 PRINT "LIVES ";L-1
125 PRINT
130 PRINT "SCORE:" PEEK 16528+2
56*PEEK 16529
140 PRINT
160 LET L=L-1
170 PRINT "PRESS A KEY TO CONTI
NUE THE GAME"
180 IF INKEY$="" THEN GOTO 180
185 CLS
190 RAND USR 17390
200 GOTO 100
210 PRINT "ALL LIVES LOST"
220 PRINT
230 PRINT "YOU SCORED:";PEEK 16
528+256*PEEK 16529
240 PRINT
250 GOSUB 370
251 PRINT A$;" HAVE THE HI-SCOR
E:";HI
252 PRINT
255 PRINT "DO YOU WANT TO PLAY
AGAIN ?"
260 IF INKEY$="" THEN GOTO 260
270 IF INKEY$="Y" THEN GOTO 4
280 IF INKEY$<>"N" THEN GOTO 26
0
290 CLS
295 STOP
300 PRINT AT 2,0;"INPUT SPEED 1
(FAST)-100(SLOW)"
330 INPUT S
340 IF S<1 OR S>100 THEN GOTO 3
30
350 POKE 17337,S
352 POKE 17254,200-S
354 POKE 17165,200/S
355 PRINT AT 2,0;"
                    ";AT 2,0;
360 RETURN
370 IF PEEK 16528+256*PEEK 1652
9<=HI THEN RETURN
380 PRINT "GOOD,A NEW [redacted]"
390 LET HI=PEEK 16528+256*PEEK
16529
395 PRINT
400 PRINT "WHAT IS YOUR NAME?"
410 INPUT A$
420 IF LEN A$>10 THEN GOTO 410
430 PRINT AT 8,0;
440 RETURN
450 SAVE "MADJUMP T[redacted]"
460 RUN
```

Listing 3.

```
16514: 7E76000202040101 = 246
16522: 060401C77A4A1400 = 426
16530: 3E01328F40210000 = 353
16538: 229040CD6E43CD64 = 901
16546: 43210B7D06203694 = 476
16554: 2310FB0620C5CDAD = 915
16562: 41C10520F8218D7B = 840
16570: 228D40CDAB42FE0A = 945
16578: C8CDAD41C3D143CD = 1019
16586: FE432A8D40118C01 = 726
16594: 19FEFE142A8D4020 = 704
16602: 0CFE1FC30000C30C = 020
16610: 41CDB8430000002A = 563
16618: 8D403A2540FEBF28 = 849
16626: 0FFE7F285AFEFE28 = 1069
16634: 6918C1CDF84211C5 = 1055
16642: 0037ED52CDAB42E5 = 1045
16650: CDAD41CD2142E1CD = 1177
16658: CF4311200037ED52 = 692
16666: 7EFE14000001188 = 748
16674: 0137CDF543FE6720 = 962
16682: 17E52A904011F401 = 764
16690: 1922904DE13A6643 = 719
16698: 3D3DCDC343C39040 = 1005
16706: EE2A904C110A0019 = 531
16714: 229040E1C3BD40CD = 1120
16722: FE42237EFEC92007 = 969
16730: 111F0037ED5200C3 = 617
16738: BD40CDF8422B7EFE = 1195
16746: C92005:120001900 = 312
16754: C3BD403A3440E61F = 863
16762: 4710FE0000000000 = 341
16770: 210B7D5FAF571936 = 605
16778: 17C9CDE04311AD01 = 911
16786: 19E5CDAB42CD2244 = 1003
16794: C31644E1CDCA4311 = 1001
16802: C600197EFE1FC8C3 = 1029
16810: 054400AF328C4021 = 535
16818: 746911844006 1F7E = 597
16826: 2B77232310F9281F = 566
16834: FE0028043D121824 = 437
16842: 7EFE1428073E0232 = 561
16850: E1411003E0532E1 = 661
16858: 413A3440E502C602 = 671
16866: 127EFE1428043614 = 536
16874: 18023694017202 3F = 403
16882: 0040FE0120030174 = 611
16890: 0209137BFE8C03F = 805
16898: 8C401F3F17328C4C = 575
16906: FE00CA8741061F7E = 867
16914: 23772B2B10F923C3 = 735
16922: C1410000000000AF = 433
16930: 328C40210C79062C = 458
16938: 7EFE0A28052310FE = 734
16946: 1828CDF842287E23 = 787
16954: FEC9280C00000000 = 507
16962: 002BCDD7422318E2 = 812
16970: 1173027DFE0C28DD = 786
16978: 19CDD7421B37ED5E = 912
16986: 18D37CFE67C83A8C = 1114
16994: 401F3F17328C4011 = 452
17002: 7302FE0020031171 = 536
17010: 0237ED52FE0028AE = 844
17018: 06207EFE0A28052E = 516
17026: 10F818D6CDF84223 = 1056
17034: 7EFED9280B00000C = 632
17042: 0000CDD7422B18E2 = 779
17050: 11720219CDD74211 = 661
17058: 710237ED5218D80C = 729
17066: 00119A437EF5060E = 626
17074: 1A7713C50121000C = 404
17082: C110F5F1016A01FE = 1057
17090: 0A28017E360537ED = 528
17098: 42228D40C9000000 = 506
17106: 0000000000D5C57E = 536
17114: 00000000011A643 = 250
17122: 060C1A7713C50121 = 413
17130: 0009C110F5018B01 = 604
17138: 37ED42D1D1C9C511 = 1175
17146: 2100060C36141910 = 166
17154: FB118B0137ED52C1 = 975
17162: C900060378ED47C5 = 1032
17170: CDB843C110F60000 = 911
17178: 0000000000000CD8F = 348
17186: 43C9000021DFE611 = 771
17194: 2100F30EFE060610 = 572
17202: FE06C0CD78D3FF19 = 1300
17210: CD4E4305C23543CD = 874
17218: 9202CD2002DD2128 = 679
17226: 43C3A402E9C90000 = 862
17234: 3A8F403D328F40FE = 837
17242: FFC021E767CDD742 = 1300
17250: 3A3440E6C7328F40 = 860
17258: C900000021006 70E = 351
17266: C0062036:42310FE = 606
17274: 36C9230D20F3C900 = 779
17282: 00003E00ED47DD21 = 624
17290: 2643C900003E1EED = 635
17298: 47DD213102C90000 = 657
17306: 15111115949E9E9E = 698
17314: 0A1E1E000A949E9E = 544
17322: 95941F940A1E1E05 = 551
17330: E1D1C30C433D0601 = 776
17338: C506FF10FEC110F8 = 1185
17346: C9CDB843326843C9 = 1077
17354: CDB843CDF842C9CD = 1381
17362: 21422A8D407EFE0F = 736
17370: C8000003C940CDB8 = 1049
17378: 43CDF842C9CD9240 = 1202
17386: CD0C43C9CD9D40C3 = 1106
17394: 0C4300ED527CFE68 = 880
17402: C03E6739CD5243CD = 1117
17410: 7541C9CDAB42118C = 982
17418: 01197E2A8D40FE17 = 676
17426: C8C3BD40E511E700 = 1125
17434: 7EFE0AE1C8C39D41 = 1232
17442: CD2142CDAD41C982 = 1078
```



EIGHT NEW BOOKS FROM INTERFACE

There's everything you need to be dynamic, advanced, intelligent and fat!

The latest books from Interface Publications Ltd are determined to put new skills at your programming fingertips —

For instance:

If you're the dynamic type and you own an Amstrad, what could be better than our latest title "DYNAMIC GAMES FOR THE AMSTRAD"?

On the other hand, if your mind is far in advance of other earthlings . . . don't despair.

"ADVANCED PROGRAMMING GUIDE TO THE BBC MICRO" and "THE QL HANDBOOK" will stretch your imagination still further.

But where do you turn if your computer is giving you dumb answers? look at our "EXPLORING ARTIFICIAL INTELLIGENCE" series for the SPECTRUM+ and SPECTRUM, the COMMODORE 64, SINCLAIR QL and BBC MICRO.

The mind will boggle!

We even have a new book for readers who think BIG.

It's called "THE BIG FAT BOOK OF COMPUTER GAMES" — for practically any micro.

All these new titles are written by the country's most respected computer authors . . . Tim Hartnell, Clive Gifford and Jeremy Ruston.

So don't despair if other books have left you feeling lethargic, jaded and hungry . . .

. . . go along to your local bookshop and let these eight new Interface books give you a "pick-me-up".

See them at all good bookshops or computer stores or write to:—

Interface Publications Ltd, (8YC)
9-11 Kensington High Street,
London W8 5NP.

Name: .....

Address: .....

.....

.....

Please send me the following books:

.....

.....

I enclose remittance in full.

Interface Publications Ltd

Interface Publications are distributed exclusively in the UK and Eire by WHS Distributors, St John's House, East Street, Leicester (0533) 551196.
Export orders handled by Interface Publications Ltd.

TERRAPIN IS A machine-code game for any Spectrum. It features high resolution movement, colour graphics, sound effects and a high score table. First, to set up the program, type in the first machine-code listing. The data is carefully checksummed so that virtually any error will be detected. If a length error occurs when you Run the program, check the left- and right-hand columns of the line concerned.

The error will be between the last correct number — or letter — and the first wrong one. In the case of a checksum error the position is more vague but, generally, the larger the difference the further along the line it is. There is always the possibility that you have typed in the checksum wrongly — this is in the first six digits. When this new program runs without errors, save it — just in case — and type New. The program will disappear but not the code.

Run completed version

Enter the second program and Run it in the same way, then save it. Type New again and enter the shorter Basic listing. The whole program can now be saved by Run 9000. It will almost certainly be error-free because of the checksum.

You can now Run the completed version. If you switched off at any time between typing, Load and Run the machine-code listings

(continued on next page)

Tired of Ken Livingstone's newt? Now try Ian Collier's . . .

TERRAPIN

Program 1.

```
 10 DATA "241924021d1ddd7e09942
8033002151 5d516000100007ba7c4527
7d178b1c01e007aa7c4527778b1c0cdc
577573e0acd167a3cdd77107a110101f
5af9257feff200511ff"
 20 DATA "297623001 80efe00200aa
f935ffe012803110 0ff f1cd937730d ff
5dd7e103d281cf578ed44ba200679ed4
4bb2808f13d3dfefa3008f5f1dd7710f
110bcf1d5c1c36477c5"
 30 DATA "22328547e52601ed5f6f7
ee1fd863eb838039018fac1c9e5d5c5f
5ed4b425b0600211a05cd5d7a2424ed4
b405bcd5d7a3e30d72424ed4b445b060
0cd5d7a3e06d72424ed"
 40 DATA "1151b44b435b0600e53e1
6d77cd77dd7cd2b2dcde32de17cfe0bc
0f1c1d1e1c9005f0001405f0001805f0
00140af0100400f0100ff000000000000
000000000000000000"
 50 DATA "000000000000000000000
000000000000000000000000000000000
000000000000000000000000000000000
000000000000000000000000000000000
000000000000000000000000000000000
000000000000000000000"
 60 DATA "253293e3d5c5f5dde5e9e
1dde1f1c1d1e3c9cdda7a115000216b0
1cdb503cde17ac9cdda7a0605c5110a0
0212003cdb503110a00215802cdb503c
110eacde17ac9cdda7a"
 70 DATA "24583221e803060ac5e51
10500cdb503e1c1113200ed5210efcde
17ac9cdda7a061421f401c5e5110500c
db503e1c11128001910f0cde17ac9cdd
a7a0605218403c5e511"
 80 DATA "1345360300cdb503e1c11
13200ed5210efcde17ac9cdda7a060a2
1e803c5e5110200cdb50310fee1c110f
2cde17ac900000000000000000000000
000000000000000000000"
 90 DATA "261328000000000021e37
b7efeffc8fe00282a1101014e2346237
9fd96433004ed441d1d4f78fd9644300
4ed44151547d9e5d9e5cdba24e1d9e1d
918ce234e234623e5cd"
 100 DATA "177220e522e118c2000f9
00fa01fa01f90002fa02f800f80003fa
03f904f904fa0005fa05f807f80006f9
06fa07fa07f90000f600f702f7000 1f6
02f602f501f50003f80"
 110 DATA "0994823f30004f804f300
05f707f707f60006f605f605f506f500
00f500f402f40005f407f407f50000f3
02f302f10000f200f101f101f20003f1
03f204f204f10005f10"
 120 DATA "168 2345f307f30006f206
f107f107f20-fcd6b0d3e02cd0116cda
27b06083e0221c07c1602c54e234623c
db67dc110f50e43065c16063e80cd007
d3a485c061621125811"
 130 DATA "14682112000e0e77230c2
0fb1910f61f1f1ff608d3fee60732d27
caf11d07cc30a0c109f409f709f205f6
05f101f401f701f801101100916051 44
c495645533a33160714"
 140 DATA "2638165 3434f52453a301
60914424f4d42533a33160b144b454c5
0203a30a00000c5e5d5f5cdaa22dd210
45bdd770122065bf1d1cda77dd5f5ed5
b365cfe803806d680ed"
 150 DATA "2490865b7b5c6f2602292
92919dd360008dd460122085be5d12a0
65b78fe00282b1a0effcb3fcb3910faa
ea1ae7723dd7e012fc609470eff1acb2
7cb2110faaea1ae77f1"
 160 DATA "236609d1cda77dd5f5180
21a772a065b7ce607fe0720177dfee03
8051120ff18031120f81924f1c1cda77
dd5f5252422065b2a085b23dd7e003dd
d7700fe00208ff1d1e1"
 170 DATA "231624c1c9e5f57c0f0f0
fe603f6586772f1e1c9c5f5c5f5cd007
d79c6074ff13ccd007dc1f578d60747f
13cf5cd007d79c6074ff13ccd007df1c
1c900000000000000000"
 180 DATA "150660000000000000000
00000472e1c1c2a470000000000000000
000000001f1c1b1f1f000000f818e8e8
8981f1e1f1e1f0000009878f878f8000
0000003f60c080ff80"
 190 DATA "1778843030fe320705f-0
58080b7b5858585ff0505b5b5858586f
c0000231 70c1b1/1f0000c4e830d8e8f
81f1f1f0b17230000f8f8f8d0e8c4000
000023170b1f1f1f00"
 200 DATA "15320400c4e8d0f8f8f81
f171b0c17230000f8e8d830e8c400000
00020170f173f3f000004e8b0d8ecec3
f3f170f17200000ececd8b0e80400000
00020170d1b37370000"
 210 DATA "15663204e3f0e8fcfc373
71b0d17200000fcfce8f0e8040000000
033170f1f1f1f000098d0e0f0f0f01f0
f173307030000f0e0c093c08000000000
00103190b070f0000c0"
 220 DATA "138996e0cce8f0f80f0f0
f070b190000f8f8f8f0e8cc000000000
80d03173f3f000004ecf0f8fcfc3f170
30d08000000fcf8f0ec040000000000
020370f1f3f00000010"
 230 DATA "174862b0c0e8fc3f3f1f0
f37200000fcfce8c0b0100000005a3c7
e7e7e3c5a5a3c7e7e7e3c5a0000ba7cf
efe7cba00005d3e7f7f3e5d000000331
70b181b18000098d0a0"
 240 DATA "13711130b030180b17330
703000030a0d098c080000000001031
90b050c0000c0e0cce8d0180c0d0c050
b1900001 8d818d0e8cc000000000 80d0
3143e3e000004ecf008"
 250 DATA "0693015c5c3e14030d080
000005c08f0ec040000000000020370
f103a00000010b0c0287c3a3a100f372
000007c7c28c0b010000000000000000
000000000000000000"
 260 RESTORE : LET z=31125
 270 FOR x=10 TO 250 STEP 10: RE
AD a$: IF LEN a$<>136 THEN PRINT
 "Length error in line ";x: BEEP
.1,30: STOP
 280 LET t=VAL a$( TO 6): LET a$
=a$(7 TO )
 290 FOR y=1 TO 65: LET a=CODE a
$: LET b=CODE a$(2)
 300 LET a=(a-48-39*(a>96))*16+b
-48-(b>96)*39: LET t=t+a*y: POKE
z,a: LET z=z+1
 310 LET a$=a$(3 TO ): NEXT y
 320 IF t THEN PRINT "Sumcheck e
rror in line ";x'" Difference=";
t: BEEP .1,25: STOP
 330 PRINT "Line ";x;" OK": NEXT
x
 340 SAVE "CODE 2'CODE 31125,162
5: VERIFY ""CODE
```

(continued from previous page)

before typing in and saving the completed version.

The control options will appear on the screen. The keyboard option uses keys QWER and T — left, right, up and down and bomb respectively — which is perhaps a little awkward, but was easier to program and you may be in practice already from using other programs. If you wish to use the cursor keys, press 2 and get the Cursor joystick option. When you are ready press 0 to start. The object of the game is to stay away from the red bugs and to save as many baby terrapins as possible. You do this by entering a question mark.

Go on to next level

A baby terrapin will probably climb onto your back. You must take it home by passing through the house which appears. However if you are unlucky, another bug will emerge and you have to get away as quickly as possible. In the eight question marks there are two bugs and six babies. When you have helped all six, you go on to the next level, which is the same, but a little more difficult and a different colour.

You get 100 points for entering a question mark containing a baby, 150 points for taking the baby back home, 50 points for stunning a bug and 80 points for entering a question mark containing a bug. If you get a high score you are asked to enter your name.

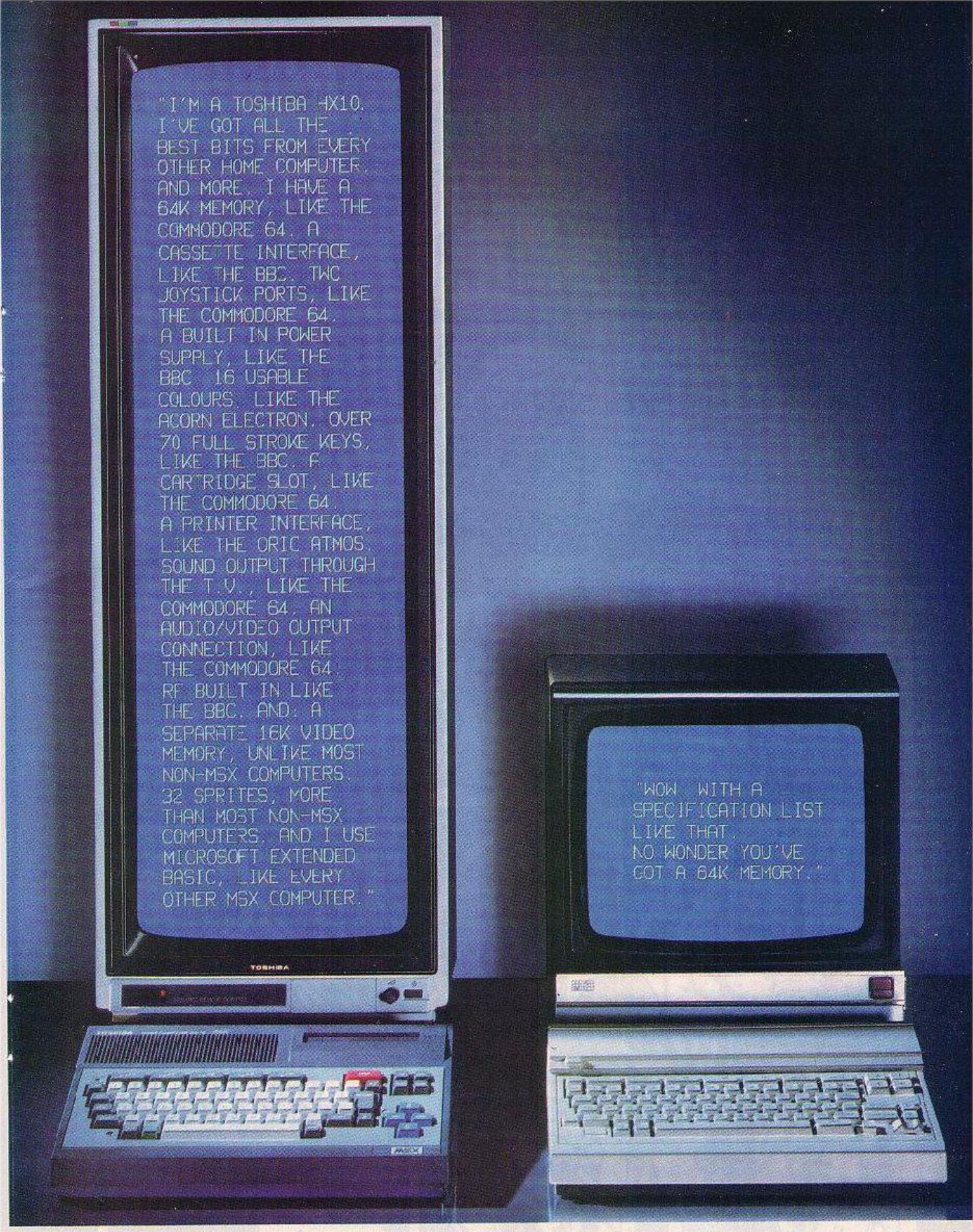
The levels differ in the method of controlling the bugs. They start off random and become more attracted to you as you finish each level.

The Basic program.

```
  10 BRIGHT 1: CLS
  20 POKE 23675,239: POKE 23676,
125: REM udg 239 inter
  35 LET rx=30460: LET yb=255: L
ET xe=63-255: LET cu=34-255
  40 DIM a$(6,20): DIM a(6)
  50 DIM b$(3,18): RESTORE: REA
D b$: 1,b$(2): 3,b
  60 DATA "KEYBOARD","CURSOR J
OYSTICK","KEMPSTON JOYSTICK"
  70 CLS: FOR x=1 TO 3: PRINT A
T x+2+6,5;x;b$(x): NEXT x: PRINT
AT 14,5;"0 START GAME": AT 0,0;
"
  75 PRINT " INK 6;" @      By I
.M.Collie"
  76 LET o=0
  80 PRINT FLASH 1;AT b+2+6,5;b;
b$(b)
  90 PAUSE 300: IF INKEY$="" THE
N GO TO 120
  95 LET z=0
 100 LET i$=INKEY$: IF (i$>="1"
AND i$<="4") OR i$="0" THEN LET a
=VAL i$: IF NOT a THEN GO TO 200
 110 IF a THEN PRINT AT b+2+6,5;
b;b$(b): LET b=a: GO TO 80-o
 120 CLS: PRINT "          TERRAPI
N HIGH SCORES": FOR x=1 TO 5:
PRINT a$(x);" ";a(x): NEXT x
 125 LET o=10
 130 PAUSE 200: IF INKEY$>="0" A
ND INKEY$<="4" THEN GO TO 95
 140 GO TO 70
 200 POKE k+2,118+(b>1): POKE k
+1,kb+(ke AND b=3)+(cu AND b=2)
 205 RANDOMIZE USR 29500: PAUSE
1: BEEP .2,-12: BEEP .2,-22: PAU
SE 1: PAUSE 150
 210 LET s=PEEK 23360+256*PEEK
23361)+10: BORDER 0
 215 LET y=1
 220 IF s<=a(y) THEN LET y=y+1:
GO TO 70+150*(y<9)
 230 CLS: PRINT "  CONGRATULATI
ONS! YOU HAVE THE ";STR$
y; AND y=1,"ND" AND y=2,"RD" AN
D y=3,"TH" AND y>3;" HIGHEST SCO
RE ": ENTER YOUR NAME: L
ET n$=""
 240 PRINT AT 5,6;"<____________
____________>"
 245 PRINT AT 5,7,n$;"_" AND LEN
n$<20
 250 PAUSE 0: BEEP .01,34: LET i
$=INKEY$: IF i$=CHR$ 12 AND LEN
n$ THEN LET n$=n$(TO LEN n$-1)
: ELSE IF (i$>="0" OR i$="_") AND i
$<>CHR$ 13 THEN GO TO 245
 260 IF i$<>CHR$ 13 AND LEN n$<2
0 THEN LET n$=n$+i$: GO TO 245
 265 IF i$<>CHR$ 13 THEN GO TO 2
45
 270 FOR x=7 TO y STEP -1: LET a
(x+1)=a(x): LET a$(x+1)=a$(x): "
 280 NEXT x: LET a(y)=s: LET a$(
y)=n$
 290 GO TO 70
1000 BORDER 0: PAPER 0: INK 7: C
LEAR 29499: LOAD ""CODE: RUN
9000 REM RUN 9000 TO SAVE
9010 SAVE "TERRAPIN" LINE 1000:
SAVE "CODE"CODE 29500,3268: VER
IFY "": VERIFY ""CODE: CLS: PR
INT "Verified OK": STOP
```

Program 2

```
  10 DATA "179136dd21045b2100002
2405bdd360c00dd363f00dd363e03dd3
64003dd364101214c5b224a5b3600dd3
62fffdd3634ffdd3614ff21195b06080
e003e03cd167afe0020"
  20 DATA "1846830a79fe022805360
20c180236012310e879fe0228160601 3
e08cd167a5f160021195b197efe0220d
e2318f8dd7e41378787324 85cdd360f9
a2100af22115bdd360c"
  30 DATA "22329000cd6e7ccd2b7a2
1757a11225b0605c54eeda00346eda00
31afeff280c3e0012d516423e8acdb67
dd113eda0eda0c110de01000fed430c5
bcda578dd361201063 2"
  40 DATA "180338fb7610fddd35122
03cdd361205214c5b7efe00280d4e234
6231605 3e2acd007d1 8eedd7e14feff2
00a01435c16063e80cd007ddd7e0cfe0
0280bed4b115b16073e"
  50 DATA "22291786cdb67dcda578c
dc6783013dd3514dd7e40c603de00dd7
740cd2b7ac31475dd7e14feff2803dd3
514cd4779301e2a405b110f001922405
bdd343fcdf97acd2b7a"
  60 DATA "205544dd7e3ffe06ca6c7
6c31475dd/e0cfe00c2147521c07c111
95b7efe8028751afe0028127e91c607f
e0e300a237e90c607fe0e38062b23231
318df1afe012839e5d5"
  70 DATA "1917232a405b110800192
2405b3e00d112cd6e7bcd2b7add7e2ff
eff200edd362f0ae1462b4eed43315b1
829dd36340ae1462b4eec43365b1B1b3
e001 2cdad762a405b11"
  80 DATA "1914720a001922405bcd2
b7add360cffdd360faeccfc763824dd7
e40fe00281ddd35402a4a5bed5b0c5b1
5151c1c7323722336 00224a5bcde97ac
d2b7a060521225bc54e"
  90 DATA "3243472346237ecbfe235
e2356623fe002825feff28653d2b2b2b7
7232323d5e602c5d1c1f5cd3279c68a4
ff14779c5d5c1d1cdb67d1844e5c5d5c
1e1cd7979cd7676e5c5"
 100 DATA "233297e1c1cdd978385fc
deb78f5e5c5e1c1cd3279c5e5c1e1164
2c68acdb67debf1e12b722b732b30053
67fcd187bcbbe2b702b7123232323c
11083dd7e12fe012022"
 110 DATA "21654521c07c11195b7ef
e8028171afe00280d4e23462bd516423
e82cdb67dd123231318e4c30374cd357
be:dd353ecd2b7a3ebe1607ed4b115bc
db67d21225b0605c54e'
 120 DATA "2538342346237efeff280
b3ebecdb67d232323c110e060ac578e
60187c60257ed4b0c5b3e9acdb67d0e0
a10fe0d20fbc110e5ed4b0c5b16073eb
ecdb67ddd7e0cfeff20'
 130 DATA "2285750c21195b7efe002
320fa2b3601dd7e3e+e00dd360f9acd3
60c00c2c273ed7b3d5cc3761bdd3441d
d363f00c35a73e5c5d5eb21225b06052
3237e2b+e8030127e92"
 140 DATA "268792c607fe0e300a2b7
e2393c607fe0e380a2323232310e0d1c
1e1c9d1c1e1af9047af914fc9cd517b5
52b5eed4b0e5baf9047af914ffeff200
105cd3279cb3fcb3fc6"
 150 DATA "251966aac5d5c1f53ebe1
607cdb67d160478d6044779c6044ff1d
d3610081d20fd1520fa1606cd007de1e
509e5c1dd351020ebe1c9c3ff7601fef
bed78110000cb472001"
 160 DATA "2455051dcb4f20011ccb5
7200114cb5f200115cb673720013fc90
1fef7ed782e00cb572802cbc501feefe
d7E1f3002cbe5ade60ead18c5db1f2f0
74f0f0f4707a9e6f5a9"
 170 DATA "215378a8e6faa818b27ab
3c8cdc5772816788220067983200 2d5c
1c5f5793c2001050909f1c1c9f57afe0
028107bfe00280b78fe002804160018 0
21e00f1cd9377d5c138"
 180 DATA '313581c60100001 8d1f57
bfe01200af1cb4f2003f5180237c9fef
f2006f1cb5f20f5f57afe012006f1cb4
720ea+5feff2006f1cb5720e0f5f1b7c
9c5d5e57ce607fe0720"
 190 DATA "1946641d7de607201 8eb2
1f0777efefe300fbb2320047e3a28042
32318ef237ebfe1d1c1c900af0620af0
e30af0e40af0e409f0150af0e60af0e8
0af0c109f04709f0400"
 200 DATA "134144f0710Bf0b20Bf0
930Bf07408f0e508f0d60Bf0370Ef0b8
08f0d007f07307f0d507f07807f0d306
f0d506f07005f07105f0f205f0B106f0
6706f0c605f02705f0f"
 210 DATA "084214805f0d104f03304
f0d504f07704f09003f07303f0d503f0
7803f0d002f07102f0e202f0c302f074
02f0b502f0d602f06702f0e802f0d101
f01401f04701f0:000f"
 220 DATA "25226103200f0b300f0b4
00f0b500f0b600f0b800f09ffcdfc762
a0c5bed4b0e5bcd5277ed430e5b220c5
be51604cd3279dd860fc1c3b67ddd7e1
4feff3fc079fe40373f"
 230 DATA "235940c078d65cfe06c9d
d7e0891c607fe0ed0dd7e0990c607fe0
ec9e5214c5b7ea7283c2391fe087e233
0f490c607fe0a30edc5d5eb2a4a5bb7e
d52e5c1d5e11b1b78b1"
 240 DATA "2571552802edb0eb36002
24a5b2a405b01050009224 05bcd2b7a3
7d1c1e1c9e1b7c978b120033e04c978f
e0028033c87c9793c37c608c9dd7e0cf
e00c8dd7e0d91fe02d0"
 250 DATA "223668dd7e0e90fe02d0d
d360f9add360c003ebfdd960edd770ef
eaf37c03e80dd960ddd770d37c9cdc57
7c26477dd7e41c602cd167afe023830d
d7e0811010195280330"
 260:
 270 CLEAR 29499: RESTORE : LET
z=29500
 280 FOR x=10 TO 250 STEP 10
 290 READ a$: IF LEN a$<>136 THE
N PRINT "Length error in line ";
x: BEEP .1,30: STOP
 300 LET t=VAL a$( TO 6): LET a$
=a$(7 TO )
 310 FOR y=1 TO 65: LET a=CODE a
$: LET b=CODE a$(2): LET a=(a-48
-39*(a>96))*16+b-48-39*(b>96)
 320 LET t=t-a*y: POKE z,a: LET
z=z+1
 330 LET a$=a$(3 TO ): NEXT y
 340 IF t THEN PRINT "Sumcheck e
rror in line ";x'" Difference=";
t: BEEP .1,25: STOP
 350 PRINT "Line ";x;" OK": NEXT
x
 360 SAVE "CODE 1"CODE 29500,162
5: VERIFY ""CODE
```



You'd expect one of the best-selling home computers in Japan to have a specification list as big as its memory.

But the Toshiba HX10 doesn't just limit itself to that.

It was developed along with other Japanese home computers to operate on one language: MSX. You can swap programs, games, cassettes, even peripherals like disk drives, printers, and joysticks: they're all compatible with every other MSX computer.

All of which makes MSX the system of the future.

So if you want a computer that won't be obsolete in a few years, buy an MSX. If you want one of the best-selling MSX computers in Japan, buy a Toshiba HX10.

TOSHIBA MSX

FOR MORE INFORMATION ON THE TOSHIBA HX10 CONTACT TOSHIBA (UK) LTD., TOSHIBA HOUSE, FRIMLEY ROAD, FRIMLEY, SURREY GU16 5JJ. TEL: (0276) 681691.

GAMES WORKSHOP

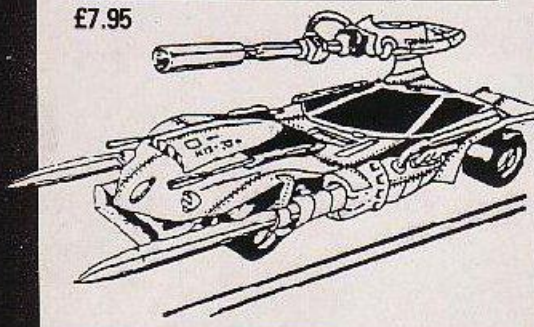
The New Force in Software

THE GAME OF DEADLY DRIVING

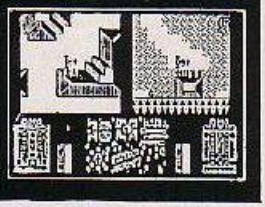
BATTLECARS

48K SPECTRUM

£7.95



"You know you've got a winner the instant you open the package - go out and buy it today!" - *P.C.N.* The only Real-Time simultaneous action 2 player Spectrum game.

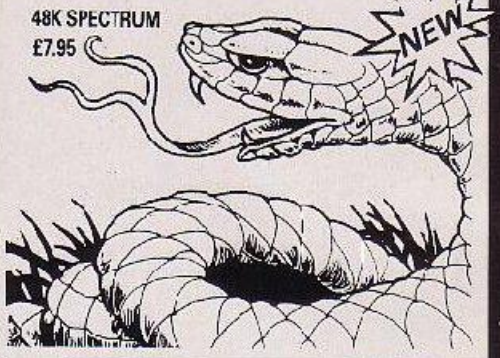


CHAOS

48K SPECTRUM

£7.95

NEW



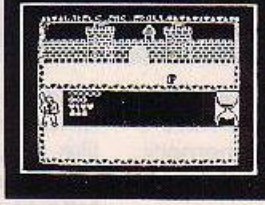
Magic and death on the plane of limbo for 1-8 sorcerers. Over 50 animated creatures and spells to summon from the depths of hell and beyond!

TALISMAN

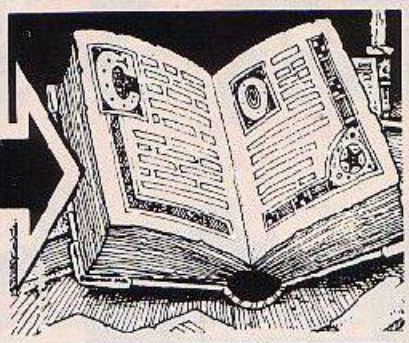
48K SPECTRUM

£7.95

NEW



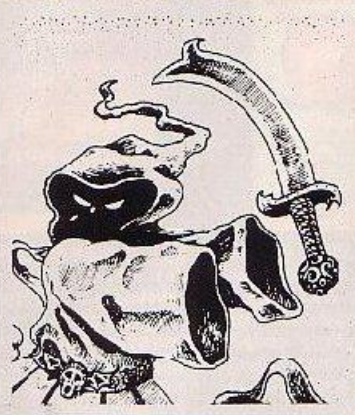
A brilliant interactive arcade adventure for 1-4 players. 50 locations full of beautiful graphics and deadly foes - the crown of command awaits!



Tower of Despair

48K SPECTRUM
£7.95

NEW ON C64 £8.95



"'Tower' is a classic... It refines the traditional adventure to perfection." - *Popular Computing Weekly*
"A startlingly original and fresh approach. Fantasy fans will love this game." *CRASH*
"It lives up to all the claims made for it." - *Micro Adventurer.*

D-DAY

48K SPECTRUM £7.95
COMMODORE 64 £8.95
QL £24.95

"An excellent and detailed wargame with graphics to match - at last!" *CRASH*
The acclaimed wargame is now on C64 and QL - contains over 200K!

NEW

Tower II Key of Hope

48K SPECTRUM £7.95

THE SPECTACULAR GRAPHIC SEQUEL TO THE CLASSIC ADVENTURE

Games Workshop games available from all good shops or direct from
GAMES WORKSHOP MAIL ORDER, 27/29 SUNBEAM ROAD, LONDON NW10
with this coupon. *Please Rush Me (tick boxes):-*

- ☐ **Battlecars** *(48 Spectrum)* £7.95
- ☐ **Chaos** *(48K Spectrum)* £7.95
- ☐ **Talisman** *(48K Spectrum)* £7.95
- ☐ **D-Day** *(48K Spectrum)* £7.95
- ☐ **D-Day** *(C-64)* £8.95
- ☐ **D-Day** *(QL)* £24.95
- ☐ **Tower of Despair** *(48K Spectrum)* £7.95
- ☐ **Tower of Despair** *(C64)* £8.95
- ☐ **Key of Hope** *(48K Spectrum)* £7.95

Cheques/POs made payable to Games Workshop Ltd.
Post & Packing free in UK. Overseas add 15% to total cost.

No man's land

ORIC/ATMOS

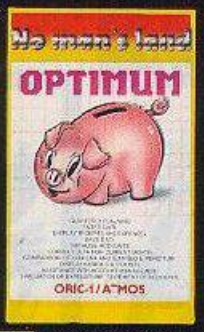
ORIC/ATMOS

OTHER TITLES FOR CBM64/V20 SPECTRUM ZX81 AVAILABLE ON REQUEST

0503 CATEG-ORIC (action game). Take command of a cruiser engaged in battle against fighter planes and submarines. Use the radar and sonar systems to detect and destroy the enemy before you are sunk. £ 7.95

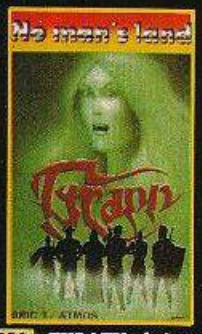
0540 STYX (arcade). Destroy the castles of the Dark One which guard the river Styx. Struggle against vultures, the eyes of the devil and his minions to vanquish evil. £ 8.50

0494 DBUG (utility). A monitor/debugger to debug your programmes in machine code: position of internal registers, set breakpoints, step through programmes. £ 11.95



0496 OPTIMUM (home). Manage up to 4 different accounts, keep track of expenditure and compare with your monthly or yearly budget. Just what you need to keep the household accounts in order. £ 9.95

0498 FIRE FLASH (arcade). Prevent the aliens from sabotaging the fuel depot and avoid enemy fire by passing into hyper space. An attractive and challenging arcade game in 100% machine code. £ 8.50

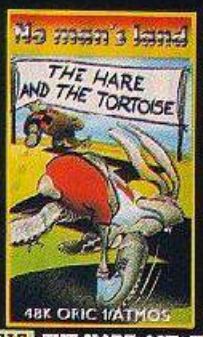


0526 TYRANN (adventure). Can you find your way through the labyrinth and liberate Queen Tyrann from her torment? A first-class adventure game with text and graphics. £ 8.95

0514 THE DIABOLICAL TOWER (adventure). The Diabolical Tower has 60 floors, each one fraught with danger. Your mission is to seek out the treasure. £ 8.50

0510 MULTIFILER (business). A powerful programme for creating files. Choose your own criteria adapted to your requirements. Rapid sort and search features in machine code and possibility of memorising over 30000 characters. Extremely simple to use. £ 14.95

0463 PANIC (action). Catch the marauding apples by setting traps. 6 levels. £ 6.95



0515 THE HARE AND THE TORTOISE (education). A game for 3-8 year olds to teach the notions of right, left, up, down and counting. The hare and the tortoise decide to race. Who will win? The level of difficulty is adjustable to the child's ability. £ 8.50

HARD communication

HER ORIC/ATMOS TITLES

97	ADDRESS BOOK	£ 9.95
98	BANK ACCOUNT	£ 12.50
99	BASIC PLUS	£ 9.95
02	COMPUTER ASSISTED DESIGN	£ 8.50
04	CHARACTER GENERATOR	£ 8.50
65	CONCOURS HIPPIQUE	£ 5.95
64	CW MORSE	£ 14.95
06	FINANCIAL CALCULATOR	£ 9.95
07	INVOICING	£ 14.95
08	LEARNING FORTH	£ 16.95
09	LIBRARY CATALOG	£ 9.95
11	SCREEN KIT	£ 9.95
13	SUPERCOPY	£ 9.95

RETAILERS CONTACT:

CentreSoft

OR ASK YOUR DISTRIBUTOR TO CONTACT US

DISTRIBUTORS AND OVERSEAS ENQUIRIES CONTACT:

JANET PELTON, INNELEC-NO MAN'S LAND 110 BIS RUE DU GAL LECLERC 93506 PANTIN CEDEX FRANCE TEL.: 33-1-840.24.31.

MAIL ORDER:

POST COUPON TO HIGH TECH UNITS 1 & 2 CONLON DEVELOPMENTS WATERY LANE DARWEN LANCASHIRE

PRICES INCLUDE POSTAGE AND PACKING FOR UK ONLY OVERSEAS ADD £2.

REF	TITLE	QTY	TOTAL PRICE

PO/CHEQUE ENCLOSED OR DEBIT ACCESS/VISA
IF CARD EXPIRY DATE:

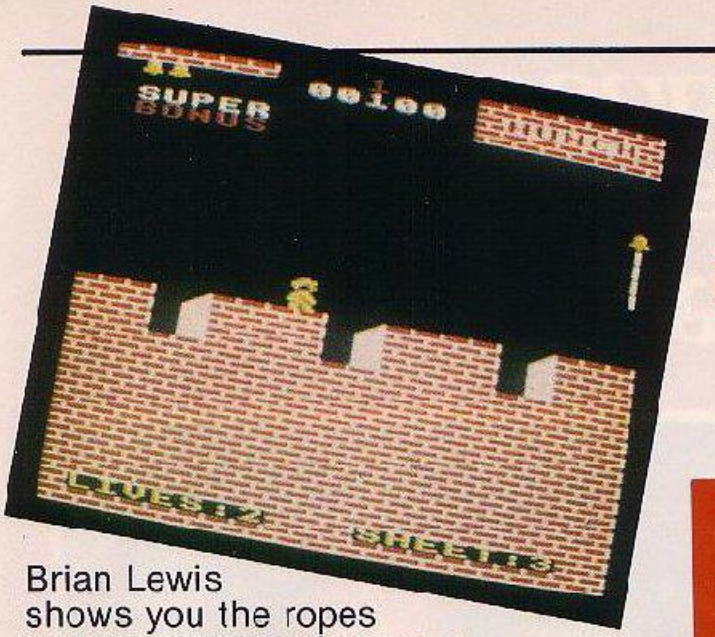
IMPORTANT: All cheques or cards payable to NO MAN'S LAND and sent to High Tech.

NAME

ADRESS

POSTCODE

YC



Available on Telesoft. See page 97 for details.

THE BELLS

Brian Lewis shows you the ropes in a humdinger of a game.

YOU PLAY the part of the famous Quasimodo whose only true love Esmeralda has been imprisoned by evil French soldiers. You must rush to save her by first clearing 14 screens to reach her. To clear a screen you just first reach the far right-hand edge of the screen then you must jump up to reach the bell rope.

Lose one of seven lives

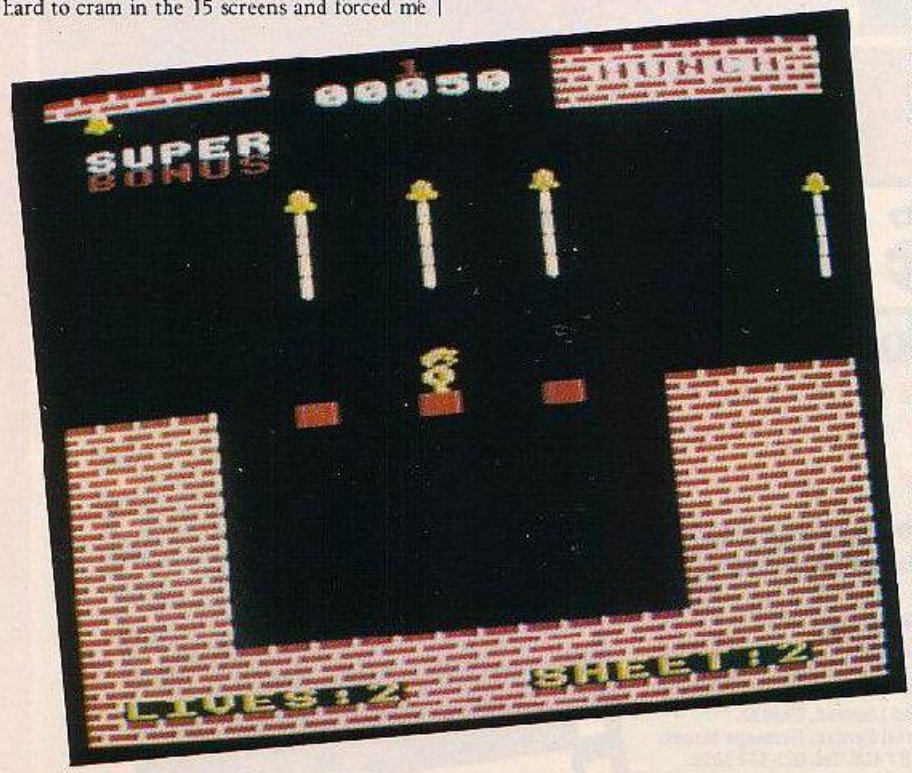
If you are hit by an arrow, a spear or you fall down a hole or pit you will lose one of your seven lives and start once more at the left-hand side of the screen. There is also a super bonus where if you gain four bells by clearing four screens without losing a life you will be given a 100 points bonus and if you manage to reach Esmeralda then you will be given 400 points and are sent back to the start of the course but this time the game will be faster.

My main problem was the small amount of memory I had to work with which made it hard to cram in the 15 screens and forced me to find a way to condense the screens. So I based all the screens on a brick wall and then devised a system where each time a screen was displayed a brick wall was drawn. Then any extras — like turrets and pits — were cut out of the wall.

Program 1.

```
   10DATA16,48,112,112,96,32,16,48,192,240,160,96,16,3
2,192,192
   20DATA96,96,96,112,48,16,16,16,224,224,224,96,192,1
28,128,192
   30DATA16,48,112,112,96,32,16,48,192,240,160,96,16,3
2,192,192
   40DATA112,112,240,240,48,112,96,112,224,224,112,176
,192,96,224,112
   50DATA48,240,80,96,128,64,48,48,128,192,224,224,96,
64,128,192
   60DATA112,112,112,96,48,16,16,48,96,96,96,224,192,1
28,128,128
   70DATA48,240,80,96,128,64,48,48,128,192,224,224,96,
64,128,192
   80DATA112,112,224,208,48,96,112,224,224,224,240,240
,192,224,96,224
   90VDU23,128,254,254,254,0,239,239,239,0
  100VDU23,129,0,24,24,24,24,24,24,24
```

(program 1 continued on page 67)



These extras are also stored in a condensed fashion which uses a form of binary, but instead of representing numbers, the 0s and 1s represent arrows, soldiers, turrets, etc., and these binary numbers are stored in line 40 of listing 2. The number 0000 represents a bell screen as this screen was a very late addition to the program and so the binary number was too small to cover all the variables.

Written in Mode 5

The program is written in Mode 5 as this provides a reasonable amount of memory a good resolution in four colours which is all that is needed to write an addictive arcade game. The game is written in machine code but other functions which do not require speed are written in Basic. All the screens are condensed thus making the listing quite short and this should aid you when you are typing it in. However this type of screen storage also has its disadvantages, a scrolling routine

(continued on page 67)

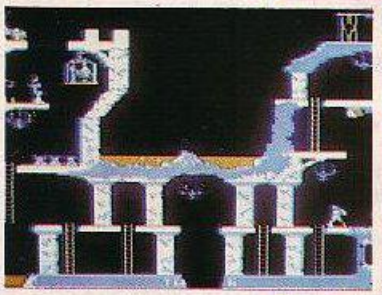
Are you brave enough to enter the savage world of mighty Conan?

You've experienced his barbaric world in movies, novels and comics. Now Conan is ready to spring to life in your home.

So flex your muscles and prepare to do battle.

Your mission is to slay Conan's wicked rival and bring home a bounty of gems. Blocking your way are fire-breathing dragons, poisonous scorpions, vicious bats and other deadly adversaries.

If that wasn't enough, you also have to fight your way through dark caves and dangerous dungeons, while looking out for mysterious creatures waiting their moment to attack!



ATARI

64

Commodore 64/ Atari Disk	£14.95
Commodore 64/ Atari Cassette	£9.95

FAMOUS FACES™ from Datasoft®

THE LEGENDARY

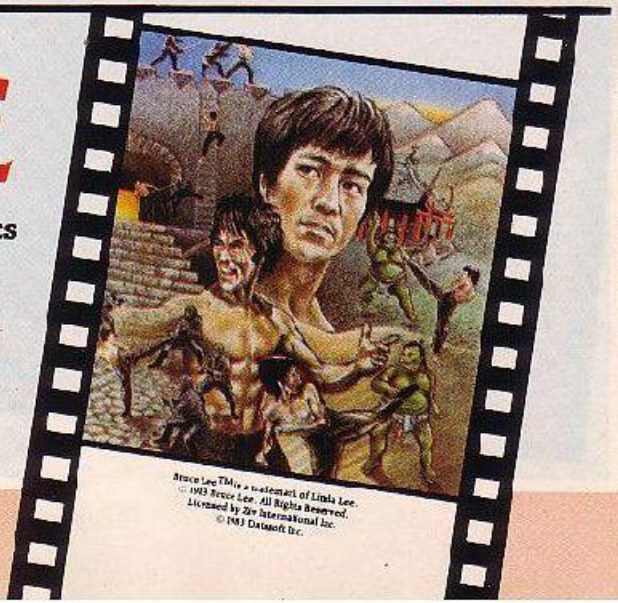
BRUCE LEE

- Twenty Secret Chambers
- Dazzling Graphics
- Unique Multiple Player Options

Spectrum 48K	£7.95
Commodore 64 Cassette	£9.95
Commodore 64 Disk	£14.95
Atari Disk/Cassette	£14.95

U.S. GOLD All American Software

U.S. Gold Limited, Unit 10, Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Tel: 021-359 3020.



Datasoft® is a registered trademark of Datasoft, Inc.® Famous Faces™ is a trademark of Datasoft, Inc. © 1984 Conan Properties, Inc. Conan and the distinctive likeness thereof are the trademarks of C.P.I. © 1984 Datasoft, Inc.

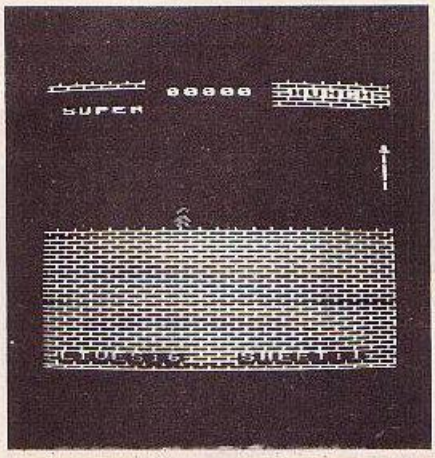
Bruce Lee™ is a trademark of Linda Lee. © 1983 Bruce Lee. All Rights Reserved. Licensed by Zev International Inc. © 1983 Datasoft Inc.

(continued from page 65)
would be impossible as there would be nothing to scroll onto but a plain brick wall whatever the sheet was.

Controlling Quasimodo

If you are looking for something to aim at in the way of scores then my personal best is 4,500. If you feel the need to design your own screens then you could change the "binary" numbers in the data statement at line 40 of listing 2 but remember that some of the combinations available offer no sort of challenge whatsoever — i.e. a flat brick wall with an arrow flying overhead — and there are few combinations I have not included in the 15 screens within the game. To control Quasimodo use the key Z — Left, X — Right, Shift — Jump, to take a run and jump press both a directional key and the jump key together.

As the game was written for the Electron BBC owners will find it too fast. To slow it down change the values of SP(1) and SP(2) in line 20. SP(1)=180 should slow the game down sufficiently.



(program 1 continued from page 65)

```
110VDU23,130,24,60,60,60,60,126,126,24
120VDU23,131,0,24,60,126,219,126,102,60
130VDU23,132,24,60,126,231,231,129,129,231
140VDU23,133,231,231,231,255,255,255,36,102
150VDU23,134,32,32,32,32,32,32,32,32
160VDU23,135,32,112,32,32,32,32,32,32
170VDU23,138,1,3,7,15,31,63,127,255
180VDU23,139,0,12,30,31,15,7,3,1
190VDU23,140,0,48,120,248,240,224,192,128
200ENVELOPE1,1,-90,-3,126,3,10,4,126,0,0,-126,126,12
6
210ENVELOPE2,2,-90,-3,126,3,10,4,126,0,0,-126,126,12
6
220ENVELOPE3,1,-90,3,-90,10,20,10,126,0,0,-126,126,1
26
230DATA1,0,3,0,1,0,2,0
240DATA0,0,0,4,15,4,0,0,0,1,2,2,15,2,2,1
250DATA1,0,2,0,255,0,25,0
260DATA0,0,0,0,0,0,0,0,1,18,32,112,48,8,20,18,14,15,
135,225,193,129,192,72,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,1,16,16,48,112,17,34,96,72,192,192,224,240,68,68,192,
0,0,0,0,0,0,0,0
270G%=&905:FORT=0TO223:READD:T?G%=D:NEXT
280MODE4:VDU19,0,4;0;
290PRINTTAB(13,3);"H U N C H Y"
300PRINT''"In this game game you play the HUNCH    BA
CK of NOTRE DAME.Your only true love  EZMERALDA has be
en imprisoned by the    evil soldiers."
310PRINT"Your task is to save her from their     clu
thches but this is not as easy as it sounds as you mus
t first clear FOURTEEN screens to reach her !"
320PRINT''"If you clear a screen then you gain a ";C
HR$130" If you have four ";CHR$130;"s  then you will b
e given a SUPER BONUS."''"But if you lose just one lif
e you lose  all the bells !!"
330PRINT''"The controls are:-"''"Z - LEFT   X - RIGH
T      shift - JUMP"
340VDU28,0,31,39,26
350CHAIN"HUNCHY2"
>
```

Program 2.

```
10*FX(229,1
20DIMSc$(2),lives(2),sh(2),SP(2):Sc$(1)="00000":Sc$
(2)="00000":NUMPL=1:lives(1)=7:lives(2)=7:bells=-1:PL$
="ONE":sh(1)=0:sh(2)=0:SP(1)=140:SP(2)=140:PROCASSEM:P
Lnum=1:*FX15,1
30MODE4:PRINTTAB(6,10);"PRESS 1 OR 2 TO START THE G
AME";:A$=GET$:IF A$="2" NUMPL=2:PLnum=1
40DATA1000,0000,0010,0001,1110,1001,0110,0000,0101,
1100,0000,1010,1101,0000,1101,END
50RESTORE40
60MODE5:VDU23,1,0;0;0;0;
70PROCSTART
80bells=bells+1
90?(delay+1)=SP(PLnum)
100FORT=1TO4:T?&D4F=0:NEXT
110FORT=0TO4:T?&D54=VAL(MID$(Sc$(PLnum),(5-T),1)):NE
XT
120A%=?&D55:A%=A%-5:?&D55=A%:CALLscore
130RESTORE40:sh(PLnum)=sh(PLnum)+1:U%=sh(PLnum):FORT
=1TOU%:READD$:NEXT:IF D$="END" THEN GOSUB1520:FORT=0TO
5000:NEXT:RESTORE40:sh(PLnum)=0:GOTO60
140FORT%=1TOLEND$:T%?&D4F=VAL(MID$(D$,T%,1)):NEXT
150VDU17,1,17,131
160PRINTTAB(13,0);STRING$(7,CHR$128)TAB(13,1);CHR$12
8;"HUNCH";CHR$128TAB(13,2);STRING$(7,CHR$128);
170IF U%=15 THEN PROCEZ
180CALLwall:PRINTTAB(0,0);STRING$(6,CHR$128):VDU17,1
28,17,3,30
190PRINTTAB(1,3);"SUPER":COLOUR1:PRINTTAB(1,4);"BONU
S"TAB(9,0);PLnum:COLOUR3
200IF U%=15 THEN 230
210FORT%=0TO11:PRINTTAB(19,T%):CHR$129;:NEXT
220VDU17,2,31,19,7,130
230COLOUR2:PRINTTAB(1,29);"LIVES:";lives(PLnum) TAB(
11,29);"SHEET:";U%
240PRINTTAB(1,1);STRING$(bells,CHR$130):IF bells>=4
THEN PROCBONUS
250IF ?&D53<>1 THEN 300
260COLOUR3
270FORT%=16TO18:PRINTTAB(3,T%),CHR$(115+T%);" "TAB(9
,T%);CHR$(115+T%);" "TAB(15,T%);CHR$(115+T%);" ";
280NEXT:COLOUR1
290FORT%=15TO17:PRINTTAB(4,T%);CHR$134TAB(10,T%);CHR
$134TAB(16,T%);CHR$134:NEXT:PRINTTAB(4,14);CHR$135TAB(
10,14);CHR$135TAB(16,14);CHR$135;
300IF ?&D52<>1 THEN 330
310FORT%=16TO18:PRINTTAB(3,T%);"  "TAB(9,T%);"  "TAB
(15,T%);"  ";:NEXT
320PROCSHADOW
330IF D$="0000" PROCbells
340CALLHX:CLS:IF ?&D01=255 THEN 1330 ELSE CALLscore:
Sc$(PLnum)="":FORT=4TO0STEP-1:Sc$(PLnum)=Sc$(PLnum)+ST
R$(T?&D54):NEXT:GOTO80
350GOTO80
360DEFPROCASSEM
370G%=&905
380M1=G%:M2=G%+64:ez=&9A5
390DIMH%3000
400FORT=0TO2STEP2
410P%=H%
420COPTT
430LDA#5:STA&70:LDA#9:STA&71
440LDA#&80:STA&72:LDA#&69:STA&73:LDA#0:STA&74:STA&75
:STA&D01:STA&D0A:STA&D0B:STA&7F:STA&60:LDA#&1B:STA&7A:
LDA#&68:STA&7B
450LDA#&EB:STA&76:LDA#&6B:STA&77
460LDA&D51:CMP#1:BNENBT
470LDY#0:.GO LDA&9BD,Y:STA(&7A),Y:INY:CPY#16:BNEGO
480.NBT JSRdis:LDA&D50:CMP#1:BNEstart
490LDY#0:.eq LDA&9BC,Y:STA(&76),Y:INY:CPY#16:BNEqq
500SEC:LDA&D55:SEC#5:STA&D55:JSRscore
510.start CLC:LDA&72:ADC#&30:STA&4D:LDA&73:ADC#1:STA
&4E:LDY#0:.a LDA(&70),Y:STA(&4D),Y:INY:CPY#16:BNEa:.b
LDA(&70),Y:STA(&4D),Y:INY:CPY#32:BNEb
520LDA&D50:CMP#1:BNENBB
530LDA&76:STA&6C:LDA&77:STA&6D:JSRobj:LDA&6C:STA&76:
LDA&6D:STA&77:.NBB
540LDA&D51:CMP#1:BNEnbt
550LDA&7A:STA&6C:LDA&7B:STA&6D:JSRobj:LDA&6C:STA&7A:
LDA&6C:STA&7B:.nbt
560LDA&D53:CMP#1:BNEio
570INC&D0E:LDA&D0B:CMP#8:BNEio:JSRmen:LDA#0:STA&D0D:
.io
580LDA&74:CMP#3E:BEQ1:JMPbag:.1 JMPfin:.bag
```

(continued on next page)

(continued from previous page)

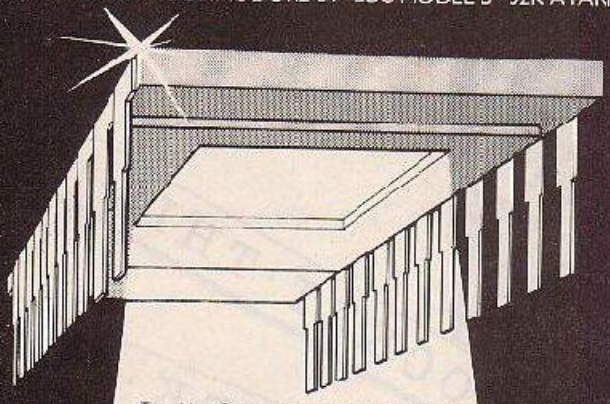
```
590JSRdelay
600JSRSEE2:LDA&75:CMP#0:BNEf:JSRSEE:.:
610LDA&D01:CMP#&FF:BNE:.JMPdead:.k
620LDA&74:CMP#0:BEQc
630LDA#&81:LDX#&7E:LDY#&FF:JSR&FFF4:CPY#&FF:BNEc
640LDA#1:STA&60:JSRrub:DEC&74:SEC:LDA&72:SBC#8:STA&7
2:LDA&73:SBC#0:STA&73
650LDA#M2 MOD 256:STA&70:LDA#M2 DIV 256:STA&71:JSRan
i
660.c LDA&74:CMP#30:BEQd:LDA#&A1:LDX#&DD:LDY#&FF:JSR
&FFF4:CPY#&FF:BNEd
670LDA#M1 MOD 256:STA&70:LDA#M1 DIV 256:STA&71
680LDA#0:STA&60:JSRrub:JSRani:INC&74:CLC:LDA&72:ADC#
8:STA&72:LDA&73:ADC#0:STA&73
690.d LDA&75:CMP#0:BNEe:LDA#&A1:LDX#&FF:LDY#&FF:JSR&
FFF4:CPY#&FF:BNEe:LDA#1:STA&75:LDA#0:STA&D00:LDA#7:LDX
#&85:LDY#9:JSR&FFF1
700.e LDA&75:CMP#0:BEQg
710JSRjump
720.g JMPstart
730.rub CLC:LDA&72:ADC#&40:STA&4C:LDA&73:ADC#1:STA&4
E:LDY#0:.A LDA#0:STA(&72),Y:STA(&4D),Y:INY:CPY#16:BNEA
:RTS
740.delay LDX#150:.B LDY#80:.C DEY:BNEC:DEX:BNEB:RTS
750.jump INC&D00:LDA&D00:CMP#7:BNED
760LDA#0:STA&75:JMPSEE
770.D LDA&D00:CMP#4:BEQdown
780JSRrub:SEC:LDA&72:SBC#&40:STA&72:LDA&73:SBC#1:STA
&73:JSRSEE3:RTS
790.down JSRrub:CLC:LDA&72:ADC#&40:STA&72:LDA&73:ADC
#1:STA&73:JMPSEE3
800.obj LDY#0:.E LDA(&6C),Y:EOR&9BD,Y:STA(&6C),Y:INY
:CPY#16:BNEE
810SEC:LDA&6C:SBC#8:STA&6C:LDA&6D:SBC#0:STA&6D
820LDY#0:.check LDA(&6C),Y:CMP#0:BNEhit:INY:CPY#16:B
NEcheck:JMPnohit
830.hit AND#15:CMP#0:BNEnohit:LDA#&11:STA&D01:.nohit
:JMPedge1
840.G JMPedge2:.WW LDY#0:.H LDA(&6C),Y:EOR&9BD,Y:STA
(&6C),Y:INY:CPY#16:BNEH
850RTS
860.edge1 LDA&6D:CMP#&6A:BEQF:JMPG
870.F LDA&6C:CMP#&C0:BNEuiW
880LDA#&F8:STA&6C:LDA#&6D:STA&6D:.uiW JMP G
890.edge2 LDA&6D:CMP#&67:BEQR:JMPWW
900.R LDA&6C:CMP#0:BNEre
910LDA#&38:STA&6C:LDA#&68:STA&6D:.re JMPWW
920.dead LDA#0:STA&76:STA&D03:STA&D05:STA&D07:STA&D0
9:LDA#2:STA&D04:LDA#&11:STA&D02:LDA#2:STA&D08:LDA#FF:
STA&D06
930.: JSRdis:LDA#7:LDX#2:LDY#&D:JSR&FFF1:LDY#0:.rese
: DEC&D06:INY:CPY#15:BNEreset:JSRdelay2:CLC:LDA&72:ADC
#&40:STA&72:LDA&73:ADC#1:STA&73:JSRdis:JSRdelay2
940INC&76:LDA&76:CMP#15:BNE1
950RTS
960.dis CLC:LDA&72:ADC#&30:STA&4D:LDA&73:ADC#1:STA&4
E:LDY#0:.J LDA(&72),Y:EOR(&70),Y:STA(&72),Y:INY:CPY#16
:BNEJ:.K LDA(&4D),Y:EOR(&70),Y:STA(&4D),Y:INY:CPY#32:D
NEK:RTS
970.delay2 LDX#50:.A1 LDY#50:.B1 DEY:BNEB1:DEX:BNEA1
:RTS
980.fin LDA&D00:CMP#3:BEQrrs:JMPbag:.rrs LDA#7:LDX#&
9D:LDY#9:JSR&FFF1:LDY#0:.ttR TYA:PHA:JSRdelay:PLA:TAY:
INY:CPY#10:BNEttR:LDA#21:LDX#5:JMP&FFF4
990.SEE CLC:LDA&72:ADC#&80:STA&4D:LDA&73:ADC#2:STA&4
E:LDY#0:.tt LDA(&4D),Y:AND#15:CMP#0:BEQgg:CMP#2:BEQgg:
INY:CPY#8:BNEtt:RTS
1000.gg LDA#&FF:STA&D01:RTS
1010.men LDA#17:JSR&FFEE:LDA#1:JSR&FFEE
1020LDA#4:STA&D0B:LDA#10:STA&D0C:LDA#16:STA&D0D:LDA&D
0A:CMP#0:BEQsp3
1030.DY#0:.hw LDA#31:JSR&FFEE:LDA&D0B,Y:JSR&FFEE:LDA#
14:JSR&FFEE:LDA#134:JSR&FFEE:LDA#31:JSR&FFEE:LDA&D0B,Y
:JSR&FFEE:LDA#3:JSR&FFEE:LDA#135:JSR&FFEE
1040LDA#31:JSR&FFEE:LDA&D0B,Y:JSR&FFEE:LDA#17:JSR&FFE
E:LDA#32:JSR&FFEE
1050INY:CPY#3:BNEhw:LDA#0:STA&D0A:RTS
1060.sp3 LDY#0:.hy LDA#31:JSR&FFEE:LDA&D0B,Y:JSR&FFEE
:LDA#13:JSR&FFEE:LDA#32:JSR&FFEE:LDA#31:JSR&FFEE:LDA&D
0B,Y:JSR&FFEE:LDA#14:JSR&FFEE:LDA#135:JSR&FFEE
1070LDA#31:JSR&FFEE:LDA&D0B,Y:JSR&FFEE:LDA#17:JSR&FFE
E:LDA#134:JSR&FFEE:INY:CPY#3:BNEhy:LDA#1:STA&D0A:RTS
1080.SEE2 CLC:LDA&72:ADC#&48:STA&4D:LDA&73:ADC#1:STA&
4E:LDY#0:.ty2 LDA(&4D),Y:AND#2:CMP#0:BNEHIT:INY:CPY#8:
BNEty0:RTS
1090.HIT LDA#&FF:STA&D0:.:RTS
1100.SEE3 CLC:LDA&72:ADC#&40:STA&4D:LDA&73:ADC#1:STA&
4E:LDY#0:.WE0 LDA(&4D),Y:CMP#2:BEQHIT:INY:CPY#16:BNEWE
0:RTS
1110.score LDA#17:JSR&FFEE:LDA#3:JSR&FFEE:LDA#31:JSR&
FFEE:LDA#7:JSR&FFEE:LDA#1:JSR&FFEE:CLC:LDA&D55:ADC#5:S
TA&D55:CMP#10:BNESHOW:LDA#0:STA&D55
1120INC&L56:LDA&D56:CMP#10:BNESHOW:LDA#0:STA&D56:INC&
D57:LDA&D57:CMP#10:BNESHOW:LDA#0:STA&D57
1130.SHOW LDY#4:.wwAA CLC:LDA&D54,Y:ADC#48:JSR&FFFE:D
EY:CPY#&FF:BNEwwAA:RTS
1140.WOMAN LDA#&18:STA&72:LDA#&63:STA&73:LDA#&38:STA&
4D:LDA#&64:STA&4E:LDY#0:.AS LDAez,Y:STA(&72),Y:INY:CPY
#32:BNEAS:.YU LDAez,Y:STA(&4D),Y:INY:CPY#64:BNEYU:RTS
1150.wall SEI:LDA#31:JSR&FFEE:LDA#0:JSR&FFEE:LDA#16:J
SR&FFEE:LDX#0:.ff LDY#0:.yy LDA#128:JSR&FFEE:INY:CPY#1
50:BNEyy:INX:CPX#2:BNEff:CLI:RTS
1160.ani LDA&60:CMP#1:BEQan2:LDA&7F:CMP#0:BEQgf:LDA#0
:STA&7F:LDA#3:STA&70:RTS:.gf LDA#1:STA&7F:LDA#&25:STA&
70:RTS
1170.ar2 LDA&7F:CMP#0:BEQfg:LDA#0:STA&7F:LDA#&45:STA&
70:RTS: fg LDA#1:STA&7F:LDA#&65:STA&70:RTS
1180.bit LDA#17:JSR&FFEE:LDA#1:JSR&FFEE:LDA#17:JSR&FF
EE:LDA#131:JSR&FFEE:JSRWOMAN
1190LDA#0:STA&D51:STA&D53:STA&D55:STA&D57:LDA#&11:STA
&D50:STA&D54:STA&D56:LDA#1:STA&D52
1200LDA#31:JSR&FFEE:LDA#0:JSR&FFEE:LDA#10:JSR&FFEE:LD
Y#0:.kN LDA#128:JSR&FFEE:INY:CPY#20:BNEkN:LDA#31:JSR&F
FEE:LDA#0:JSR&FFEE:LDA#29:JSR&FFEE:LDY#0:.nK LDA#128:J
SR&FFEE:INY:CPY#20:BNEnK:LDA#0:STA&74:STA&7F:STA&60:ST
A&72:LDA#&62:STA&73
1210LDA#17:JSR&FFEE:LDA#128:JSR&FFEE:LDA#17:JSR&FFEE:
LDA#3:JSR&FFEE:LDA#31:JSR&FFEE:LDA#0:JSR&FFEE:LDA#17:J
SR&FFEE:LDY#0:.rts LDA&57C0,Y:JSR&FFEE:INY:CMP#13:BNEr
ts
1220LDA#17:JSR&FFEE:LDA#2:JSR&FFEE:LDA#31:JSR&FFEE:LD
A#7:JSR&FFEE:LDA#6:JSR&FFEE:LDY#0:.wS LDA&57B0,Y:JSR&F
FEE:INY:CMP#13:BNEwS:LDA#31:JSR&FFEE:LDA#17:JSR&FFEE:L
DA#10:JSR&FFEE:LDA#32:JSR&FFEE
1230LDA#5:STA&70:LDA#9:STA&71:JSRdis
1240.walk JSRdelay:JSRdis:JSRani:JSRSOU:CLC:LDA&72:AD
C#8:STA&72:LDA&73:ADC#0:STA&73:JSRdis:INC&74:LDA&74:CM
P#34:BNEwalk:JSRdelay:JSRdelay:JSRdelay
1250LDA#3:STA&D51:STA&D53:STA&D55:STA&D57:LDA#&11:STA
&D50:STA&D54:STA&D56:LDA#2:STA&D52
1260LDA#8:STA&74:.DROP JSRdelay:JSRdis:JSRani:JSRSOU:
CLC:LDA&72:ADC#&40:STA&72:LDA&73:ADC#1:STA&73:JSRdis:I
NC&74:LDA&74:CMP#19:BNEDROP:LDA#34:STA&74
1270LDA#0:STA&D51:STA&D53:STA&D55:STA&D57:LDA#&11:STA
&D50:STA&D54:STA&D56:LDA#1:STA&D52
1280JSRdis:LDA#45:STA&70:LDA#9:STA&71:LDA#1:STA&60:J
SRdis:.back JSRdelay:JSRdis:JSRani:JSRSOU:SEC:LDA&72:S
BC#8:STA&72:LDA&73:SBC#0:STA&73:JSRdis:DEC&74:LDA&74:C
MP#0:BNEback:RTS
1290.SOU LDA#7:LDX#&50:LDY#&D:JMP&FFF1
1300]
1310NEXT
1320ENDPROC
1330lives(PLnum)=lives(PLnum)-1:sh(PLnum)=sh(PLnum)-1
:bells=0:A%=?&D55:A%=A%-5:?&D55=A%:CALLscore:IF lives(
PLnum)=0 THEN 1370
1340IF NUMPL=2 AND PLnum=1 PLnum=2:PL$="TWO" ELSE IF
NUMPL=2 AND PLnum=2 PLnum=1:PL$="ONE"
1350IF NUMPL=2 PROCSTART
1360GOTO90
1370*FX15,1
1380IF PLnum=1 THEN PRINT'''"GAME OVER PLAYER ONE";F
ORG=0TO5000:NEXT:CLS:IF NUMPL=2 AND lives(2)<>0 GOTO1
340
1390IF PLnum=2 THEN PRINT'''"GAME OVER PLAYER TWO";F
ORT=0TO5000:NEXT:CLS
1400IF lives(1)<>0 THEN 1340
1410T%=0:lives(1)=7:lives(2)=7:bells=-1:PL$="ONE":sh(
1)=0:sh(2)=0:P$=STRING$(20,".")+"PRESENTING HUNCHY BY
BRIAN LEWIS.....STARRING.....
....QUAZIMODO.!!.AND.EZMERALDA...WITH...FULL...SUPPORT
ING...CAST...OF..."
1420P$=P$+"SOLDIERS.":Sc$(1)="0000":Sc$(2)="0000":PLn
um=1:NUMPL=1:SP(1)=120:SP(2)=120
1430COLOUR1:A%=((U%-1)/15)*100:PRINTTAB(1,4);"YOU COM
PLETED:";A%;"%"TAB(1,6);"OF THE NOTRE DAME'''";SPC(4);"
BATTLEMENTS"
1440COLOUR131:PRINTTAB(0,15);STRING$(20,CHR$128)TAB(0
,19);STRING$(20,CHR$128);:COLOUR128:COLOUR3
1450PRINTTAB(2,2);"ANOTHER GO ?(Y/N)";:COLOUR2
1460PRINTTAB(0,17);MID$(P$,T%,20);:T%=T%+1:IFT%=178 T
HEN T%=1
1470A$=INKEY$(10):IF A$<>"" THEN1490
1480GOTO1460
1490IF A$="Y" THEN 30
1500IF A$<>"N" THEN 1460
1510CALL&D9D2
1520VDU13,19,0,10;0;:FORT%=1TO255STEP5:SOUND1,3,T%,1:
NEXT
1530PRINT'"WELL DONE !!!'''"BUT NOW TRY IT"'''"WHEN IT
'S FASTER"
1540lives(PLnum)=lives(PLnum)+1:SP(PLnum)=SP(PLnum)-2
0:FORT%=1TO8:CALLscore:NEXT:Sc$(PLnum)="":FORT=4TO0STE
P-1:Sc$(PLnum)=Sc$(PLnum)+STR$(T?&D54):NEXT:RETURN
1550DEFPROCEZ:PRINTTAB(17,10);STRING$(3,CHR$128);:FOR
T%=5TO9:PRINTTAB(17,T%);CHR$128;:NEXT
1560COLOUR12E:PRINTTAB(18,6);CHR$139;CHR$140:COLOUR13
1
1570CALLWOMAN
1580ENDPROC
1590DEFPROCSHADOW:COLOUR131:FORT%=17TO18:PRINTTAB(4,T
%);" "TAB(10,T%);" "TAB(16,T%);" ";:NEXT:COLOUR128:COL
OUR3:PRINTTAB(4,16);CHR$138TAB(10,16);CHR$138TAB(16,16
);CHR$138;:ENDPROC
1600DEFPROCBONUS:COLOUR1:PRINTTAB(7,15);"BONUS":SOUND
&11,3.1,?55:FORG=0TO100W:NEXT
1610*FX21,5
1620FORT%=1TO4:PRINTTAB(T%,1);" ";:SOUND&11,1,255,4:F
ORG=0TO200:NEXT,:FORG=0TO200:NEXT
1630bells=0:PRINTTAB(7,15);"      ":CALLscore:CALLscor
e:Sc$(PLnum)="":FORT=4TO0STEP-1:Sc$(PLnum)=Sc$(PLnum)+
STR$(T?&D54):NEXT:ENDPROC
1640DEFPROCbells:FORT%=16TO26:PRINTTAB(4,T%);STRING$(
11," ");:NEXT:IF U%=8 ?&D50=1 ELSE IF U%=11 ?&D50=1:?&
D51=1 ELSE IF U%=14 ?&D50=1:?&D51=1
1650COLOUR129:PRINTTAB(6,16);" "TAB(9,16);" "TAB(12,1
6);" ":COLOUR128
1660COLOUR3:FORT%=7TO10:PRINTTAB(6,T%);CHR$129TAB(9,T
%);CHR$129TAB(12,T%);CHR$129;:NEXT:COLOUR2:PRINTTAB(6,
6);CHR$130TAB(9,6);CHR$130TAB(12,6);CHR$130:ENDPROC
1670DEFPROCSTART:$&57C0="GET READY PLAYER '+PL$:$&57B
0="HUNCHY':FORT%=0TO4:T%?&57F0=T%?&D54:NEXT:CALLbit
1680*FX21,5
1690FORT%=0TO4:T%?&D54=T%?&57F0:NEXT:FORG=0TO100:NEX
T:CLS:ENDPROC
```

All orders for goods supplied through the On Line system will be fulfilled by Empire Stores Ltd. at 18 Canal Road, Bradford, West Yorkshire. This scheme is available to any applicant under the age of 19. For current interest rate please ask at your local NatWest branch.

The Complete

Machine Code Tutor

SPECTRUM 48K · COMMODORE 64 · BBC MODEL B · 32K ATARI



Trust New Generation to strip the mystery away from Machine Code. Now the Complete Machine Code Tutor makes learning machine code simple so there's never been a better time to discover the really great benefits of machine code programming – see what the press says:

"A colourful, clear, interactive computer teaching package – the best I've come across in any field."
Jan Watterson – **Popular Computing Weekly**

"This pair of tapes forms a worthy addition to the range, giving a thorough exposition from the most elementary level of machine code programming on the BBC Micro."
Which Micro & Software Review

"The best machine code tutor and no serious Spectrum programmer should learn machine code without it."
Crash

"By far the best attempt comes from New Generation Software who has recently issued its Complete Machine Code Tutor for the BBC and the Spectrum."
Popular Computing Weekly

"New Generation have got a very nice product here. It's well thought out, easy to use, aesthetically pleasing, and (as far as I could tell) bug-free and crash-proof"
"Overall then, an excellent idea, well executed."
Computing Today

Supplied with full notes, this package teaches machine code the way it should be taught – at your own pace and actually from the microcomputer, not from a book. You learn programming the professional way, plus a few tricks of the trade. Available from all good computer stores at £14.95

New Generation Software

New Generation products are sold according to their terms of trade and conditions of sale.
FREEPOST, Bath BA2 4TD. Tel: 0225 316924

Selected titles of New Generation Software are available from your local computer store and larger branches of: WHSMITH John Menzies WOOLWORTH spectrum Boots

ORIC AND SINCLAIR COMPUTERS

Oric 1 computer 48K £85 (£82) £92. Oric Atmos computer 48K £111 (£158) £168. CCP40 Oric colour printer £124 (£115) £132. Sinclair flat screen TV £110 (£105) £115. Sinclair Spectrum Plus Computer £162 (£176) £187. Sinclair QL Computer £406 (£385) £410. Sinclair Spectrum 48K £131 (£131) £143. Microdrive £51 (£50) £60. RS232 interface 1 £51 £50) £60. Special offer Microdrive + Interface 1 + 4 cartridges £102 (£100) £120. Blank microdrive cartridges £5.50 (£6) £7. Standard floppy disc interface for Spectrum £102 (£92) £112. (See Cumana disc section for suitable disc drives). Fuller FDC keyboard for Spectrum £52 (£52) £62. Fuller master unit £56 (£56) £62. Interface 2 £20-£45 (£20) £21. 32K memory upgrade kit for 16K Spectrum (issue 2 and 3 only) £31 (£26) £30. Spectrum Centronics printer interface £51 (£47) £52. ZX printer has been replaced by the Alphacom 32 £71 (£69) £82. 5 printer rolls (state whether Sinclair or Alphacom) £13 (£16) £21. ZX compactor £46 (£44) £64. 16K ram packs for ZX81 £28 (£25) £30.

COMMODORE COMPUTERS

Commodore C16 Starter Pack £145 (£142) £162. Commodore Plus/4 £305 (£281) £301. Commodore 64 £222 (£215) £235. Convertor to allow most ordinary micro cassette recorders to be used with the Vic 20 and the Commodore 64 £9.78 (£9) £11. Bargain package: cassette convertor + compatible cassette recorder £37 (£38) £41. Commodore cassette recorder £40 (£44) £50. Printer interfaces for Vic20 and the Commodore 64: Centronics £45 (£41) £46. RS232 £45 (£41) £46. Disc drive £232 (£208) £234. 1520 printer/plotter £165 (£149) £159. MPS801 Printer £239 (£220) £245. Light pen £28 (£28) £33.

ACORN COMPUTERS

Electron £173 (£179) £199. BBC Model B £404 (£357) £387. Kenda double density disk interface system £149 (£131) £141. See below for suitable disc drives.

CUMANA DISC DRIVES

To suit disc interfaces of Sinclair Spectrum, BBC B and Videogenie. Single: 40 track single sided £178 (£158) £176, 40 track double sided £218 (£195) £215, 80 track single sided £207 (£186) £206. 80 track double sided £234 (£209) £229. Dual: 40 track single sided £299 £280 £329, 40 track double sided £395 (£353) £393. 80 track single sided £372 (£334) £374, 80 track double sided £437 (£390) £430.

PRINTERS

Oki Microline 80 £138 (£135) £165. Brother HR5 £162 (£146) £170. Shinwa CT CP280 £237 (£228) £258. Cannon PW1080A £382 (£344) £374. Epson RX80 £277 (£251) £282. Epson RX80F/T £314 (£286) £316. Epson FX80 £358 (£290) £328. Combined matrix printers and electric typewriters: Brother EP22 £173 (£166) £186, Brother EP44 £258 £235) £260. CCP40 Oric Colour printer/plotter £124 (£115) £132. Interfaces to run the above printers from Vic and the Commodore 64 £45 (£41) £46. We can supply interfaces to run the above printers from Sharp computers £58 (£52) £59.

UK101, SUPERBOARD AND VIDEOGENIE

We still support these Computers. Write for our list.

COMPUTER REPAIRS

We offer a world-wide repair service. Write for a quotation.

SWANLEY ELECTRONICS
The Computer Export Specialists.
Dept YC, 32 Goldsel Rd., Swanley, Kent BR8 8EZ, England.
Tel: SWANLEY (0322) 64851.

Official orders welcome. UK prices are shown first and include post and VAT. The second price in brackets is for export customers in Europe and includes insured airmail postage. The third price is for export customers outside Europe (including Australia etc) and includes insured airmail postage.

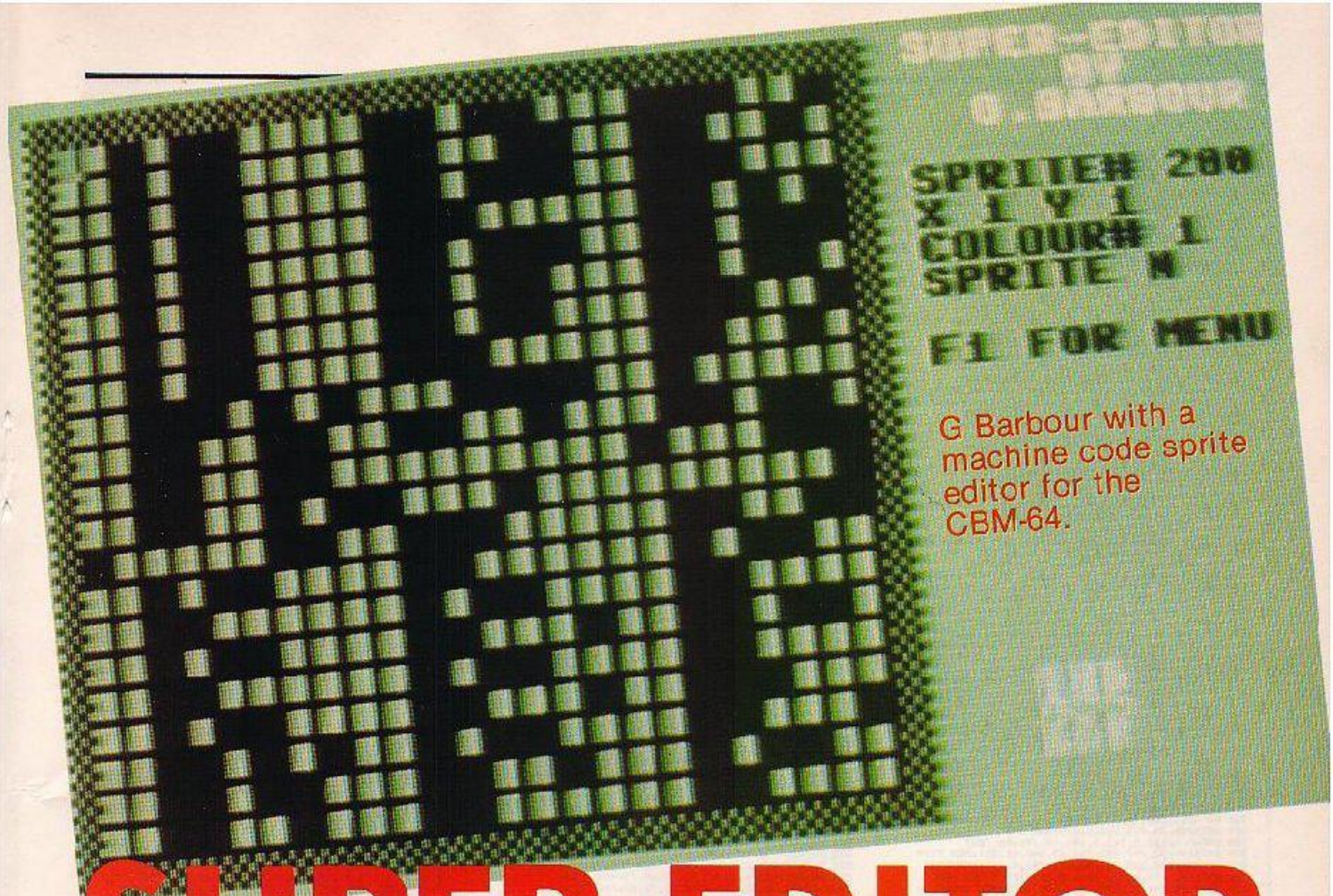
Believe in the beat... its back on the street!..

Breakdance 2 is ELECTRIC BOOGALOO

Original Soundtrack Album on MCA Records, Tape and LCD

Released by Cannon Film Distributors (UK) Ltd.

STILL SHOWING
CLASSIC HAYMARKET (DOLBY STEREO) CLASSIC OXFORD ST. (DOLBY STEREO)
AND ALSO FROM MARCH 1st ALL OVER LONDON
SOUTHERN-ANGLIA-AND CENTRAL TV AREAS
FROM APRIL 19 ON RELEASE IN GRANADA-WESTWARD-YORKSHIRE TYNE TEES-HARLECH-SCOTTISH-BORDER AND GRAMPIAN TV AREAS



G Barbour with a machine code sprite editor for the CBM-64.

SUPER EDITOR

MOST COMMODORE 64 users *do* have a Sprite Editor, but these are usually written in Basic. Super-Editor is written completely in machine code and resides in a part of memory not used by Basic or sprites — C000 to D000. Super-Editor can be loaded into memory and left there oblivious to any Basic program. It can then be called up by a simple Sys command when needed. This means that you can program, edit sprites and continue programming without losing your Basic program.

Program 1 is the main program and must be entered, leaving out the Rem statement at the end of each line. These will be used to check that the program has been correctly entered. After being entered, program 1 must be saved. Program 2 must be entered while program 1 is still in memory.

Now type Run 50000. On the screen will appear: 200 . . . followed by a value.

You must check that this value is the same as the value in the Rem statement which corresponds to line 200. If it is correct, press any key and the program will go on to the next line. When all lines have been checked, the program will stop with an Out of Data error. If the values do not correspond, press Run Stop and check that line. After correcting the line Run 50000 again. When all errors have been corrected, erase program 2 and Save the program.

To activate the program type

SYS 49280

You are now in the main screen.

On the left of the screen will be a 24 by 21 grid, surrounded by a checked border. On the grid will be displayed the current sprite and shortly after that a flashing cursor will appear in the top left corner of the grid. At the bottom right side of the screen will appear the current sprite in normal size.

In the top right hand corner of the screen will be displayed:

(i) The current sprite number.
(ii) The color of the current sprite.
(iii) The type of sprite. N = Normal M = Multi-colored.

The flashing cursor can be moved around using the cursor keys.

Clear will clear the grid.

Home will position the cursor at the top left corner.

. (Period) plots a dot.

Space will clear a dot — un-plots it.

C will increase the color value to the next higher value.

T will change the sprite type from normal to multi-colored or vice versa.

+ will display the next sprite.

− will display the previous sprite.

F1 will display the menu page.

Run Stop will return you to Basic.

The Menu Page will display five functions:

1 STORE DATA
2 INPUT DATA
3 TRANSFER
4 SEARCH
5 GOTO

The computer will wait for you to press one of these numbers, 1 to 5.

STORE DATA: The screen will clear and when prompted, you must enter the first sprite that you wish to be saved followed by the last sprite that you wish to be saved.

After this a sub-menu will be displayed asking whether to store to disc, tape or program lines.

If you choose disc or tape, you will be asked to enter a file name. When the computer has finished saving it will return to the main screen.

If you choose program lines, you will be asked to stipulate the line at which to start the data. In this case the last sprite is ignored as only the first sprite will be stored. The values for this sprite are stored in data statements which are read by the Basic read command. The first value is the address of the sprite. To Poke the sprite into memory, have a line similar to:

```
10 READ AD: FOR
I = OTO62:READX:POKEAD + 1,X:NEXTI
```

Once the computer is finished storing the data, it will return to the main screen.

INPUT DATA: This function allows you to load sprite data into memory. When prompted, you must enter the device number and the file name.

TRANSFER: This allows the data from one sprite to be transferred to another. The parameters that must be entered are the

(continued on next page)

Program 1.

```
1 A=49.52
2 READ:IF0=-1THENPRINT"(CLR)SYS492B0":NEW
3 POKEA,B:PRINT:A=A+1:GOTO2
200 DATA160,0,185,80,3,141,64,3,105:REM 4033
201 DATA01,3,141,65,3,200,300,197,0:REM 4737
202 DATA141,66,3,141,67,3,141,68,3:REM 2757
203 DATA141,69,3,162,15,14,64,3,46:REM 1981
204 DATA65,3,224,248,173,66,3,109,66:REM 4513
205 DATA3,141,66,3,173,67,3,109,67:REM 3258
206 DATA3,141,67,3,173,68,3,109,68:REM 3276
207 DATA3,141,68,3,216,234,202,16,216:REM 6471
208 DATA162,2,189,66,3,72,74,74,74:REM 3220
209 DATA74,32,104,192,104,41,15,32,104:REM 3281
210 DATA192,202,16,236,169,0,32,210,255:REM 6632
211 DATA191,2,141,188,96,208,67,3,250:REM 3337
212 DATA4,169,3,208,5,9,48,141,99:REM 3347
213 DATA3,76,210,255,255,127,255,255,255:REM 9962
214 DATA0,106,76,63,193,24,76,240,255:REM 6548
215 DATA144,32,32,32,32,32,32,32,32:REM 1552
216 DATA32,32,32,32,32,32,83,80,80:REM 2653
217 DATA69,82,45,69,68,73,84,79,82:REM 3380
218 DATA13,32,32,32,32,32,32,32,32:REM :421
219 DATA32,32,32,32,32,32,163,163,163:REM 4584
220 DATA163,163,163,163,163,163,163,163,163:REM 7335
221 DATA13,32,32,32,32,32,32,32,32:REM :421
222 DATA32,32,32,32,32,32,32,32,32:REM :440
223 DATA32,32,66,89,32,32,32,32,32:REM :770
224 DATA13,32,32,32,32,32,32,32,32:REM :421
225 DATA32,32,32,32,32,32,32,32,32:REM :440
226 DATA32,32,187,183,32,32,32,32,32:REM 2357
227 DATA13,13,13,32,32,32,32,32,32:REM 1326
228 DATA32,32,32,32,32,32,32,32,32:REM :440
229 DATA32,71,46,66,65,32,66,79,85:REM 3252
230 DATA32,32,32,13,32,32,32,32,32:REM :414
231 DATA32,32,32,32,32,32,32,32,32:REM :440
232 DATA32,32,163,163,163,163,163,163,163:REM 6942
233 DATA163,163,32,32,13,13,13,,3,80:REM 1771
234 DATA82,69,83,83,32,85,73,89,32:REM 2897
235 DATA75,69,89,0,169,147,32,210,255:REM 6406
236 DATA169,0,141,32,208,141,33,208,160:REM 5951
237 DATA0,185,135,192,32,210,255,200,201:REM 8157
238 DATA0,208,245,32,228,255,20,,0,240:REM 7516
239 DATA249,76,251,193,0,147,144,166,166:REM 6638
240 DATA166,166,166,166,166,166,166,166,166,166:REM 7470
241 DATA166,166,166,166,166,166,166,166,166,166:REM 7470
242 DATA166,166,166,166,166,166,166,13,0,166:REM 5071
243 DATA186,186,186,186,186,186,186,186,186,186:REM 8370
244 DATA186,186,186,186,186,186,186,186,186,186:REM 8370
245 DATA186,186,186,186,186,186,186,0,144:REM 6364
246 DATA166,166,166,166,166,166,166,166,166,166:REM 7470
247 DATA166,166,166,166,166,166,166,166,166,166:REM 7470
248 DATA166,166,166,166,166,166,166,166,166,0:REM 5576
249 DATA160,0,185,100,193,32,210,255,200:REM 7562
250 DATA201,0,208,245,162,0,234,160,0:REM 5533
251 DATA185,130,193,32,210,255,200,201,0:REM 6740
252 DATA208,245,169,13,32,210,255,252,224:REM 8334
253 DATA21,208,232,169,255,,33,253,169,80:REM 7725
254 DATA133,254,160,0,185,159,193,32,210:REM 6485
255 DATA255,200,201,0,208,245,169,18,32:REM 5391
256 DATA210,255,96,32,185,193,76,232,194:REM 7323
257 DATA200,78,1,1,,,0,,,1,9:REM 383
258 DATA0,0,169,0,141,8,194,141,9:REM 3627
259 DATA194,32,207,255,201,,3,240,81,201:REM 7119
260 DATA30,144,245,201,58,176,241,41,15:REM 5353
261 DATA170,173,8,194,141,10,194,173,9:REM 4904
262 DATA194,141,11,,94,,4,8,194,46,9:REM 3210
263 DATA194,14,8,194,46,9,194,24,173:REM 4413
264 DATA8,194,109,10,194,141,,8,194,173:REM 5744
265 DATA9,194,109,11,,194,141,,9,194,14:REM 4335
266 DATA8,194,46,9,,94,138,24,138,24:REM 3856
267 DATA109,8,194,141,8,194,169,0,109:REM 4639
268 DATA9,194,141,9,194,76,20,154,96:REM 4030
269 DATA160,0,169,29,32,210,255,200,192:REM 7316
270 DATA226,208,244,76,134,251,122,252,160:REM 8120
271 DATA0,77,251,32,210,255,200,201,0:REM 6823
272 DATA208,246,169,13,32,210,255,96,32:REM 5520
273 DATA85,83,80,80,69,82,45,69,68:REM 3062
274 DATA73,84,79,82,0,32,32,32,32:REM 1766
275 DATA32,32,66,89,0,32,32,32,:REM 1547
276 DATA71,46,66,65,82,66,79,85,82:REM 3398
277 DATA0,0,32,,44,83,80,82,73,84:REM 3481
278 DATA69,35,0,32,88,32,32,32,69:REM 2180
279 DATA0,32,67,79,76,79,85,82,35:REM 3001
280 DATA0,32,83,80,82,73,84,49,32:REM 2999
281 DATA0,0,32,70,49,32,70,79,82:REM 2673
282 DATA32,77,69,78,85,0,169,19,32:REM 2753
283 DATA210,255,32,109,194,162,144,160,194:REM 7228
284 DATA32,,22,,94,32,109,194,162,159,160:REM 6541
285 DATA194,32,210,255,32,109,194,162,163:REM 6380
286 DATA160,194,32,122,194,32,,109,,94,162:REM 6097
287 DATA182,160,194,32,122,194,32,109,191:REM 5828
288 DATA162,183,160,194,32,122,194,32,109:REM 5271
289 DATA194,162,193,160,194,32,122,194,32:REM 5593
290 DATA109,194,162,200,160,194,32,122,174:REM 6693
291 DATA32,109,194,162,209,160,194,32,122:REM 6197
292 DATA194,32,109,194,162,218,160,194,32:REM 6439
293 DATA122,194,32,109,194,162,219,160,194:REM 7543
294 DATA32,122,194,24,160,32,162,4,32:REM 3418
295 DATA210,255,173,1,134,141,00,3,189:REM 3194
296 DATA0,141,81,3,32,0,192,24,160:REM 3573
297 DATA35,162,6,32,240,255,173,5,194:REM 6232
298 DATA141,80,3,165,0,141,81,3,32:REM 2711
299 DATA0,192,24,160,29,162,5,32,240:REM 4664
300 DATA255,173,3,194,141,80,3,32,0:REM 2848
301 DATA192,24,160,33,162,5,32,240,255:REM 6131
302 DATA173,4,194,141,80,3,32,0,192:REM 3697
303 DATA24,160,34,162,7,32,240,255,173:REM 5098
304 DATA2,194,32,210,255,169,4,141,21:REM 4990
305 DATA208,141,16,208,173,1,194,141,20:REM 6977
306 DATA7,173,5,194,141,40,208,169,200:REM 6697
307 DATA141,5,208,169,0,141,4,208,173:REM 5546
308 DATA2,194,201,77,240,8,169,0,141:REM 5001
309 DATA28,208,76,223,195,169,4,141,28:REM 4961
310 DATA208,173,3,194,105,1,141,29,208:REM 4961
311 DATA5,173,4,194,105,1,141,23,208:REM 4764
312 DATA127,41,133,251,169,4,133,252,169:REM 6991
313 DATA141,6,194,141,7,194,32,14:REM 3554
314 DATA196,169,41,133,69,169,4,133,70:REM 4270
315 DATA76,139,197,234,173,1,194,133,73:REM 5831
316 DATA169,0,133,74,160,0,6,73,38:REM 2632
317 DATA74,24,200,192,6,208,246,183,0:REM 3470
318 DATA169,0,133,251:169,160,133,252,177:REM 7917
319 DATA73,32,156,196,200,192,63,208,246:REM 7860
320 DATA169,54,133,1,169,0,133,251,169:REM 5905
321 DATA160,133,252,169,41,133,73,169,4:REM 4760
322 DATA133,74,24,160,1,162,1,32,240:REM 4393
323 DATA255,162,1,160,0,177,251,201,1:REM 5658
324 DATA240,8,169,186,32,210,255,76,117:REM 6373
325 DATA196,169,16,32,210,255,169,32,32:REM 5023
326 DATA210,255,169,146,32,210,255,200,192 REM 8344
327 DATA24,208,222,169,13,32,210,255,169:REM 7070
328 DATA29,32,210,255,24,165,251,105,24:REM 5666
329 DATA133,251,165,252,105,0,133,252,232:REM 7698
330 DATA224,22,208,192,169,55,133,1,96:REM 4638
331 DATA0,141,155,196,138,72,152,72,173:REM 5680
332 DATA133,156,162,0,160,0,169,0,141:REM 3.42
333 DATA155,156,165,0,24,145,251,200,192:REM 6437
334 DATA8,208,241,24,165,251,105,8,133:REM 5579
335 DATA251,144,2,230,252,104,168,104,170:REM 6887
336 DATA96,0,234,169,0,133,251,169,176:REM 6965
337 DATA133,252,169,41,133,73,169,4,133:REM 4823
338 DATA74,162,0,160,0,177,73,201,160:REM 5659
339 DATA240,7,169,0,145,251,76,240,196:REM 7208
340 DATA169,1,145,251,200,192,24,208,234:REM 7700
341 DATA24,165,73,105,40,133,73,165,74:REM 4488
342 DATA105,0,133,74,24,165,251,105,24:REM 4723
343 DATA133,251,165,252,105,0,133,252,232:REM 7698
344 DATA224,25,208,201,173,1,194,133,251:REM 7254
345 DATA169,0,133,252,160,0,6,251,38:REM 4768
346 DATA252,24,200,192,6,208,246,169,0:REM 6029
347 DATA133,73,169,176,133,74,169,54,133:REM 5411
348 DATA1,162,0,169,0,141,201,196,160:REM 6262
349 DATA0,14,201,196,24,177,73,109,201:REM 5789
350 DATA156,141,201,196,200,192,8,208,239:REM 7888
351 DATA138,168,173,201,196,145,25,,152,170:REM 8150
352 DATA24,165,73,105,8,133,73,165,74:REM 4328
353 DATA105,0,133,74,252,224,61,208,210:REM 7306
354 DATA169,55,133,1,173,1,194,141,250:REM 6289
355 DATA7,96,173,1,194,133,251,169,0:REM 5399
356 DATA133,252,160,0,6,251,38,252,24:REM 5151
357 DATA200,192,6,208,246,96,254,169,255:REM 8525
358 DATA123,53,169,37,133,54,32,228,255:REM 6226
359 DATA21,0,208,27,198,53,165,53,201:REM 5629
360 DATA225,208,241,193,54,165,54,201,255:REM 7727
361 DATA208,233,160,0,177,53,73,128,145:REM 5707
362 DATA65,76,139,197,160,0,72,177,69:REM 4767
363 DATA201,250,240,11,201,32,208,,1,169:REM 5127
364 DATA160,145,69,76,206,197,169,,22,,45:REM 6637
365 DATA65,104,201,147,240,38,201,3,240:REM 6487
366 DATA7,201,46,240,36,201,32,240,35:REM 5382
367 DATA21,29,240,34,201,157,240,33,201:REM 6615
368 DATA17,240,32,201,145,240,31,201,19:REM 5538
369 DATA240,30,76,225,198,76,198,197,76:REM 6170
370 DATA21,198,76,38,198,76,99,198,76:REM 5204
371 DATA111,198,76,123,198,76,149,198,76:REM 5584
372 DATA172,198,76,198,198,76,222,198,0:REM 6172
373 DATA32,117,197,160,0,169,0,145,251:REM 5930
374 DATA200,192,64,208,247,76,232,194,169:REM 7996
375 DATA147,32,210,255,160,0,185,57,198:REM 6154
376 DATA73,210,255,200,201,0,208,245,96:REM 7362
377 DATA83,85,80,67,82,32,69,68,73:REM 3058
378 DATA84,79,32,32,66,89,32,71,82:REM 3010
379 DATA65,72,55,77,32,66,65,82,66:REM 2972
380 DATA79,85,32,13,13,71,79,79,68:REM 2832
381 DATA32,44,39,67,46,0,169,160,160:REM 4040
382 DATA0,145,59,32,202,196,76,123,198:REM 6105
383 DATA169,122,160,0,,45,69,32,202,196:REM 5636
384 DATA76,123,198,173,7,194,201,24,240:REM 6566
385 DATA16,24,230,59,165,70,105,0,133:REM 4207
386 DATA70,24,230,7,194,76,149,197,76:REM 5502
387 DATA148,197,173,7,,94,201,,,240,24:REM 7406
388 DATA206,7,194,198,69,165,69,201,255:REM 7315
389 DATA200,233,193,70,76,,48,,97,173,6:REM 5637
390 DATA194,201,21,240,223,238,6,194,24:REM 5972
391 DATA148,69,105,40,133,69,165,70,105:REM 4217
392 DATA0,133,70,76,148,197,173,6,194:REM 5707
393 DATA201,1,240,197,206,6,194,24,165:REM 5812
394 DATA69,233,39,133,69,176,185,198,70:REM 6054
395 DATA76,148,197,76,232,,94,201,67,240:REM 7694
396 DATA23,201,84,240,12,201,73,240,21:REM 5573
397 DATA201,43,240,20,201,45,240,19,201:REM 6003
398 DATA133,240,18,76,,48,,97,76,14,199:REM 5538
399 DATA76,76,199,76,190,199,76,119,199:REM 6098
400 DATA76,144,199,76,7,200,238,5,194:REM 5952
401 DATA173,5,194,201,,8,208,5,169,0:REM 4384
402 DATA141,5,194,173,5,194,14,,41,208:REM 5801
403 DATA24,160,35,162,6,32,240,255,169:REM 6560
404 DATA32,32,210,255,32,210,255,24,160:REM 6583
405 DATA35,162,6,32,240,255,173,5,194:REM 6232
406 DATA141,80,3,169,0,141,81,3,32:REM 2711
407 DATA0,192,76,148,197,173,2,194,201:REM 6602
408 DATA78,240,9,169,78,141,2,194,76:REM 4747
409 DATA232,194,0,169,77,141,2,194,76:REM 4777
410 DATA232,194,32,117,197,160,0,177,251:REM 6804
411 DATA73,255,145,251,200,192,64,208,245:REM 8491
412 DATA76,232,194,238,1,194,24,160,35:REM 5006
413 DATA162,4,32,240,255,169,32,32,210:REM 5885
414 DATA255,32,210,255,32,210,255,76,232:REM 7870
415 DATA191,20,,,94,24,160,35,162,4:REM 4942
416 DATA32,240,255,169,32,32,210,255,32:REM 6103
417 DATA210,255,32,210,255,76,232,194,147:REM 7386
418 DATA29,29,29,29,29,29,29,29,29:REM 1305
419 DATA29,29,29,42,83,85,80,65,82:REM 3117
420 DATA85,69,68,73,84,79,82,32,77:REM 3096
421 DATA69,78,85,42,13,13,13,45,41:REM 1643
422 DATA32,83,84,79,82,69,32,68,65:REM 2943
423 DATA84,65,13,50,41,32,73,76,80:REM 2705
424 DATA85,84,32,68,65,84,65,13,51:REM 2468
425 DATA41:32,84,82,65,78,83,70,69:REM 3240
426 DATA82,13,52,41,32,83,69,65,82:REM 2827
427 DATA67,72,13,53,41,32,71,79,84:REM 2744
428 DATA79,,3,0,160,0,185,169,159,32:REM 4913
429 DATA210,255,200,201,0,208,245,32,228:REM 7395
430 DATA255,201,0,240,249,201,52,240,16:REM 6496
431 DATA201:53,240,15,201,49,240,14,201:REM 5987
432 DATA51,240,13,201,50,240,12,76,62:REM 4314
433 DATA200,76,137,200,76,224,200,76:REM 6195
434 DATA203,76,199,203,160,0,140,250,7:REM 5407
435 DATA152,72,169,147,32,210,255,104,141:REM 6697
436 DATA80,,3,72,169,0,141,81,3,32:REM 2733
437 DATA0,192,32,228,255,201,0,240,249:REM 8934
438 DATA201,88,240,15,104,168,200,192,0:REM 5621
439 DATA208,215,169,147,32,210,255,76,96:REM 6410
440 DATA193,104,169,147,32,210,255,76,96:REM 6173
441 DATA193,147,71,79,84,79,32,83,80:REM 3518
442 DATA82,73,84,69,32,35,0,160,0:REM 2406
443 DATA185,122,200,32,210,255,230,201,0:REM 6745
444 DATA208,245,32,12,194,173,8,194,141:REM 5727
445 DATA1,194,76,96,193,147,83,84,65:REM 4686
446 DATA82,84,32,83,80,82,73,84,69:REM 3374
447 DATA58,0,69,78,68,32,83,80,82:REM 3048
448 DATA73,84,69,58,0,147,49,41,32:REM 2521
449 DATA68,73,83,75,13,53,41,32,34:REM 2427
450 DATA65,80,69,13,51,41,32,76,73:REM 2474
451 DATA78,69,32,78,85,77,66,69,32:REM 3263
452 DATA83,0,0,0,160,0,185,152,250:REM 5774
453 DATA32,210,255,200,201,0,208,245,32:REM 6726
454 DATA12,194,173,1,194,141,222,200,173:REM 7458
455 DATA8,194,141,1,194,32,117,197,165:REM 5868
456 DATA251,133,67,165,252,133,68,169,13:REM 5381
457 DATA32,210,255,160,0,185,177,200,32:REM 6094
458 DATA210,255,200,201,3,208,245,32,12:REM 5451
459 DATA194,172,8,194,200,140,1,194,32:REM 5025
460 DATA117,197,165,251,133,73,165,252,133:REM 7481
461 DATA74,160,0,185,189,200,32,210,255:REM 7478
462 DATA200,201,0,208,245,32,228,255,201:REM 8294
463 DATA0,240,249,201,49,240,11,201,50:REM 5651
464 DATA240,10,201,51,240,9,76,57,20:REM 5134
465 DATA76,129,197,76,171,201,76,52,202:REM 6068
466 DATA147,70,73,76,69,78,85,77,69:REM 3315
467 DATA58,,,160,0,185,95,201,32,210:REM 5556
468 DATA255,200,201,0,208,245,160,0,32:REM 5176
469 DATA207,255,153,80,207,200,201,13,208:REM 7114
470 DATA245,136,96,32,101,201,152,72,169:REM 5805
471 DATA1,162,8,160,1,32,186,255,104:REM 5464
472 DATA147,80,160,207,32,189,255,145,73:REM 6606
473 DATA170,165,74,138,169,67,32,210,255:REM 6888
474 DATA173,222,200,141,1,,194,76,96,193:REM 5987
475 DATA32,101,201,152,72,169,1,,62,,:REM 4121
476 DATA160,1,32,186,255,169,13,32,210:REM 5528
477 DATA255,104,140,30,160,207,32,189,255:REM 7342
478 DATA165,73,170,165,74,168,169,67,32:REM 4866
479 DATA216,255,173,222,200,,41,,,,196,76:REM 6222
480 DATA96,197,63,65,84,65,0,160,0:REM 3036
481 DATA185,218,201,32,2,0,255,200,201,0:REM 6940
482 DATA208,245,76,149,197,32,210,255,169:REM 6980
483 DATA2,133,73,169,169,13,141,119,2,,1:REM 4567
484 DATA120,2,96,83,89,85,0,,60,0:REM 2967
485 DATA185,255,201,32,2,0,255,200,201,0:REM 7014
486 DATA208,245,96,173,80,3,201,0,240:REM 5663
487 DATA3,76,0,192,169,48,32,210,255:REM 6255
488 DATA96,147,83,84,65,82,84,73,73:REM 3666
489 DATA71,32,76,73,78,69,32,35,0:REM 1963
490 DATA0,0,160,0,169,7,,41,51,202:REM 4580
491 DATA185,33,202,32,210,255,200,201,0:REM 6573
492 DATA208,245,32,12,194,173,8,,94,133:REM 3655
493 DATA73,173,9,194,133,74,169,147,32:REM 4978
494 DATA210,255,169,17,32,210,255,32,210:REM 6696
495 DATA255,173,8,,194,141,80,3,173,9:REM 4072
496 DATA194,141,81,3,32,0,192,32,223:REM 4498
497 DATA201,165,67,141,80,3,165,68,141:REM 4682
498 DATA81,3,32,0,192,169,13,32,210:REM 4394
499 DATA255,32,3,202,169,151,141,80,3:REM 4541
500 DATA169,202,,41,81,3,32,0,192,76:REM 3747
501 DATA237,201,24,165,72,105,10,133,73:REM 4157
502 DATA165,74,105,0,133,74,,4,142,0:REM 3201
503 DATA142,50,202,169,147,32,210,255,169:REM 7482
504 DATA7,32,210,255,32,210,255,24,165:REM 6613
505 DATA73,105,10,133,73,165,74,105,0:REM 3558
506 DATA133,74,165,73,141,80,3,165,74:REM 4260
507 DATA141,81,3,32,0,192,32,223,201:REM 5409
508 DATA160,3,177,67,141,80,3,169,0:REM 3517
509 DATA141,81,3,152,72,32,17,202,169:REM 4723
510 DATA44,32,210,255,104,168,200,204,51:REM 6777
511 DATA202,208,228,,77,67,141,80,3,32:REM 4053
512 DATA7,202,24,165,67,105,8,133,67:REM 3841
513 DATA165,68,105,0,133,68,174,20,202:REM 5125
514 DATA232,142,50,202,169,15,32,210,255:REM 5596
515 DATA32,3,202,169,38,141,60,3,169:REM 4461
516 DATA203,141,81,3,32,0,192,76,237:REM 4985
517 DATA201,174,50,202,224,8,240,15,224:REM 6491
518 DATA7,240,3,76,167,202,169,6,141:REM 5347
519 DATA51,202,76,167,202,177,222,200,141:REM 7822
520 DATA1,194,76,96,,93,147,64,82,65:REM 4677
521 DATA78,83,70,69,82,32,83,80,82:REM 3291
522 DATA73,84,69,32,35,0,84,79,32:REM 2259
523 DATA83,80,82,73,84,65,32,35,0:REM 2119
524 DATA160,0,185,69,203,32,210,255,200:REM 7508
525 DATA201,0,208,245,32,12,194,173,1:REM 4789
526 DATA194,141,222,200,173,E,194,141,1:REM 5550
527 DATA194,32,117,197,165,251,133,253,165:REM 8168
528 DATA252,133,254,160,0,185,88,203,200:REM 7070
529 DATA32,2,0,255,201,0,208,245,32,12:REM 5338
530 DATA,94,,73,8,194,141,1,194,32,117:REM 4718
531 DATA,97,,60,0,177,253,145,251,200,192:REM 8445
532 DATA4,208,247,173,222,200,141,1,194:REM 5984
533 DATA76,96,193,147,76,79,65,68,32:REM 3576
534 DATA8,69,86,73,67,65,32,35,0:REM 2009
535 DATA,60,0,185,184,203,200,32,210,255:REM 7865
536 DATA201,0,208,245,32,12,194,169,15:REM 4844
537 DATA32,2,0,255,32,101,201,152,162,80:REM 4136
538 DATA,60,207,32,189,255,169,1,173,8:REM 5186
539 DATA:94,,60,1,32,186,255,169,0,32:REM 4576
540 DATA213,255,76,96,193,0,0,0,0:REM 2303
541 DATA0,255,111,0,255,0,255,0,255:REM 6198
550 DATA -1
```

(continued from previous page)

source sprite's number and the number of the sprite where the data must be placed.

SEARCH: This allows you to look through all the sprites in memory to find one you are looking for. In the top left corner the number is displayed and in the lower right corner, the sprite. Pressing any key will advance to the next sprite. Pressing Space allows for rapid searching. Pressing X returns you to Main Screen. Sprite 0 will have a blank for its sprite number.

GOTO: This allows you to jump to any sprite in the memory. When you return to main screen, the sprite you selected to Goto will be the current sprite.

Although the program is very lengthy and will take a long time to enter, you can be sure there are no errors as each line is checked after being entered. If you possess a machine code monitor — such as Supermon — you can save the program by using the command

```
S "EDITOR",C000,D000
```

Once saved, it can be quickly loaded directly into memory by

```
LOAD "EDITOR",8,1
```

If using tape, substitute 01 for 08 when saving and 1 for 8 when loading.

Happy editing. ■

Program 2.

```
50000 FL=200
50010 CO=1:AV=0:FORI=0TO8:READA:AV=AV+(CO*A):CO=CO+1:NEXT
50020 PRINT"LINE";FL;"...";AV
50030 PRINT"(C/DN)(C/DN)PRESS"
50040 GETA$:IFA$=""THEN50040
50060 FL=FL+1:GOTO50010
```

BRIAN JACKS SUPERSTAR Challenge

"Winning's not the most important thing – it's the only thing"

Brian Jacks, world famous Judo and TV Superstars champion made it very clear.

"It better be good," he said.

We didn't feel like arguing the point, so we just got to work.

The result is one of the most exciting, addictive and challenging games you will ever have attempted.

We feel it only fair to warn you though – challenge Brian Jacks to anything and YOU'D better be good

Brian Jacks challenges you to these eight events:

★ ARM DIPS ★ SQUAT THRUSTS
★ CANOEING ★ CYCLING
★ FOOTBALL ★ SWIMMING
★ ARCHERY ★ 100 METRES

Available from all leading software retailers
OR order today by mail.
CBM-64 £3·95 fast load cassette £12·95 disc
48K Spectrum/BBC-B/Electron/Amstrad £7·95
prices include VAT & p/p

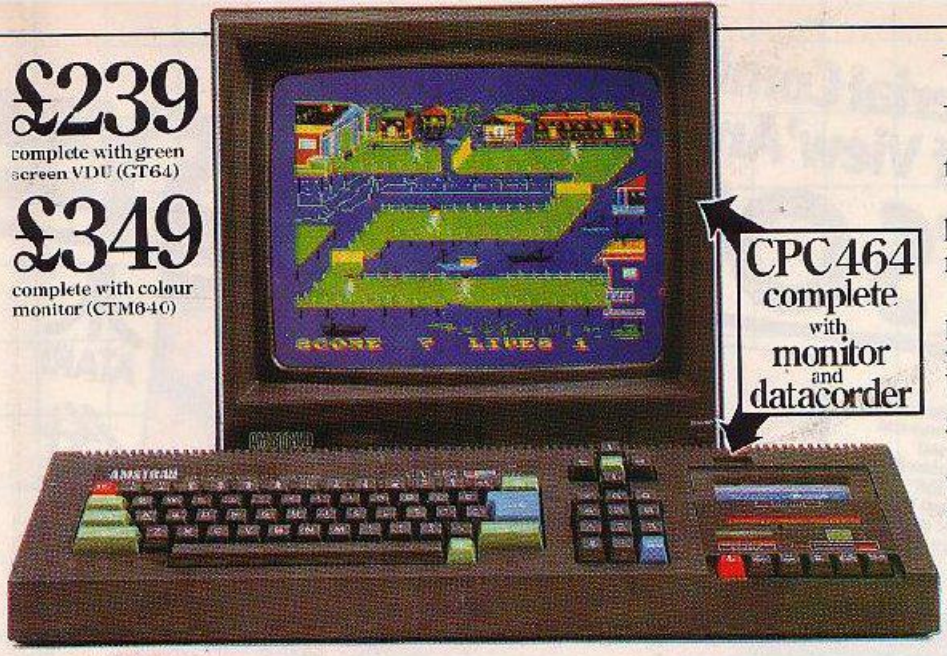
martech Martech is the registered trade mark of Software Communications Limited
Martech House, Bay Terrace, Pevensey Bay, East Sussex BN24 6EE
TRADE ENQUIRIES WELCOME. PHONE (0323) 768456 TELEX: 87165 EXIM Brighton

48K SPECTRUM · COMMODORE 64 · BBC 'B' · ELECTRON · AMSTRAD

Now Amstrad gives you over £100 to play with.

£239
complete with green screen VDU (GT64)

£349
complete with colour monitor (CTM640)



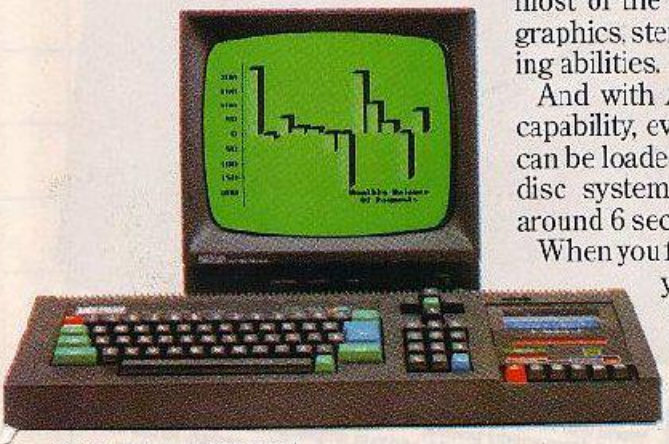
CPC 464 complete with monitor and datacorder

Free software worth over £100 is the name of the game.

Along with your new CPC 464 (colour monitor or green screen VDU) you'll receive a software starter pack of 12 (yes, twelve) cassettes absolutely free.

There's something for everyone. From Roland-on-the-Ropes to Easi-Amsword word processing.

That's *one* good reason for making Amstrad's CPC 464 your new home computer.



CPC 464 green screen VDU (GT64)

Here are the others.

The CPC 464 comes complete with its own colour monitor or green screen VDU and built-in cassette data recorder. (Optional disc drives are now available with CP/M* and DR. LOGO* supplied as standard.)

It has a typewriter-style keyboard and numeric keypad. 64K of RAM, 32K of ROM and a very fast extended BASIC with real time features.

And it costs a great deal less than the price of a comparable system.

The CPC 464 can handle the trickiest computer games (if you can), revision for exams, cataloguing and budgeting.

And it comes complete and ready-to-go.

Amsoft. A ton of software.

Yes. Now there are over 100 titles from Amsoft and independent publishers. And the list is still growing.

Arcade games, educational programs and business applications – they're all designed to make the most of the CPC 464's impressive graphics, stereo sound and processing abilities.

And with Amstrad's *speedloading* capability, even complex programs can be loaded quickly. The optional disc system will load a game in around 6 seconds.

When you feel the need to upgrade your Amstrad system to disc drive, just send your favourite Amsoft cassettes to us and we'll send you back the same Amsoft programs on Amsoft disc for just £4.95 per cassette, the price of a blank disc.

Join in the fun.

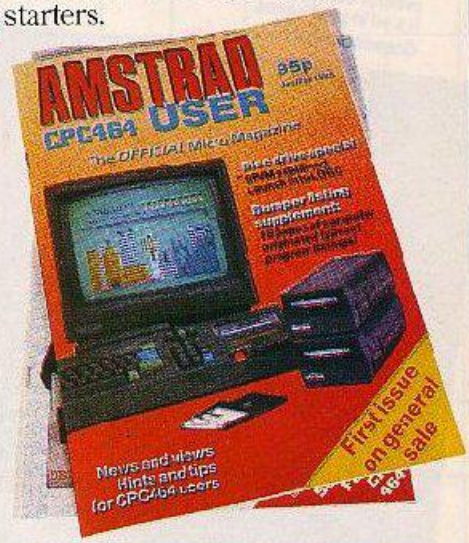
Our CPC 464 User Club is a must for all owners.

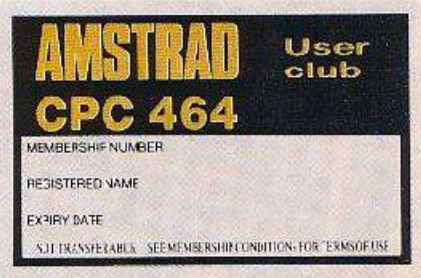
As a member, you'll be the first to know about the additions to the range. Hardware and software.

We'll provide you with your own privilege card and send you free, a year's subscription to the Amstrad User magazine packed with programs, features and information.

You can enter competitions for valuable prizes and keep up with all the latest Amstrad developments.

And with the free software pack, we think that's pretty good for starters.





AMSTRAD
ONE GREAT IDEA AFTER ANOTHER

BOOTS COMET Currys Dixons Greens John Menzies RUMBELOWS spectrum WHSMITH WIGFALLS WOOLWORTH AND OTHER COMPUTER STORES

*CP/M and DR LOGO are Trade Marks of Digital Research

I'd like to know more about the exciting CPC 464 complete computer system. Please send me literature right away.

NAME

ADDRESS

POSTCODE

To: Amstrad Consumer Electronics PLC, Brentwood House, 169 King's Road, Brentwood, Essex CM14 4EF.

PRICES CORRECT AT TIME OF GOING TO PRESS. NOT ALL STORES STOCK ALL PRODUCTS.

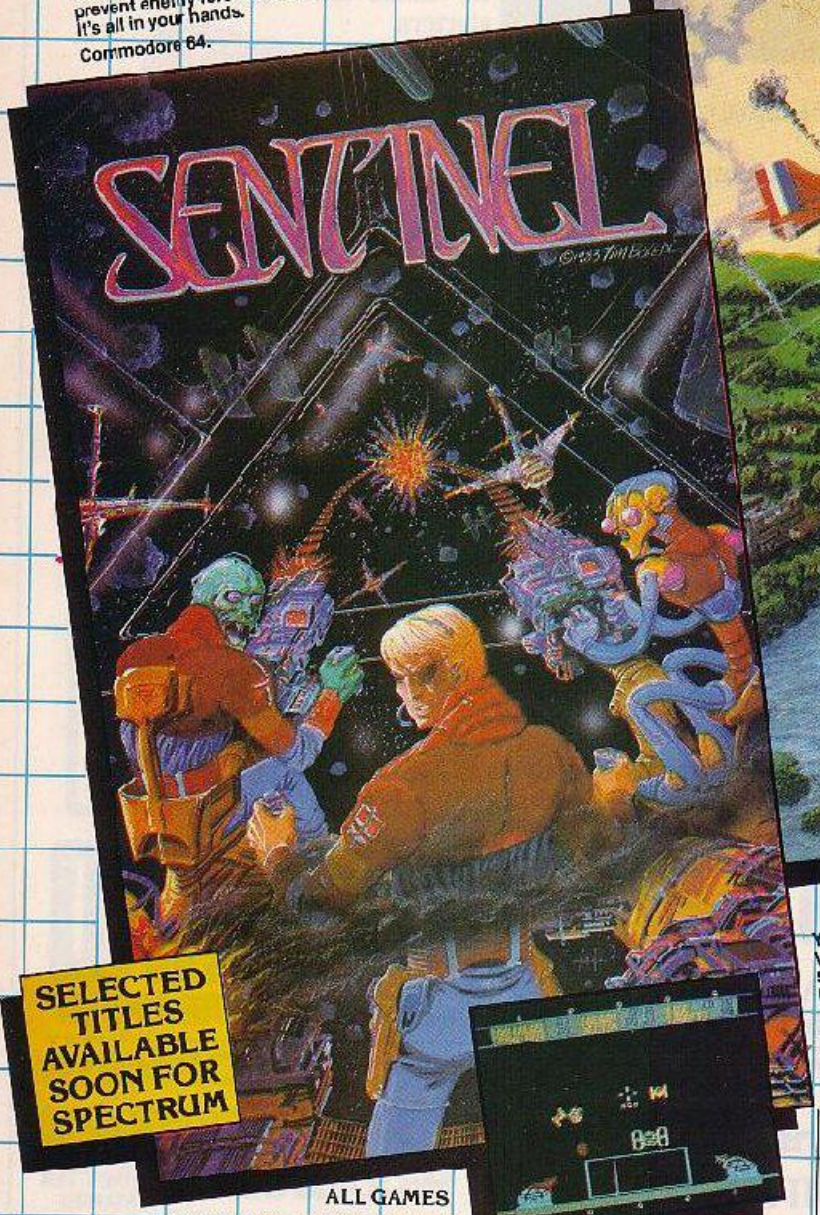
YC7

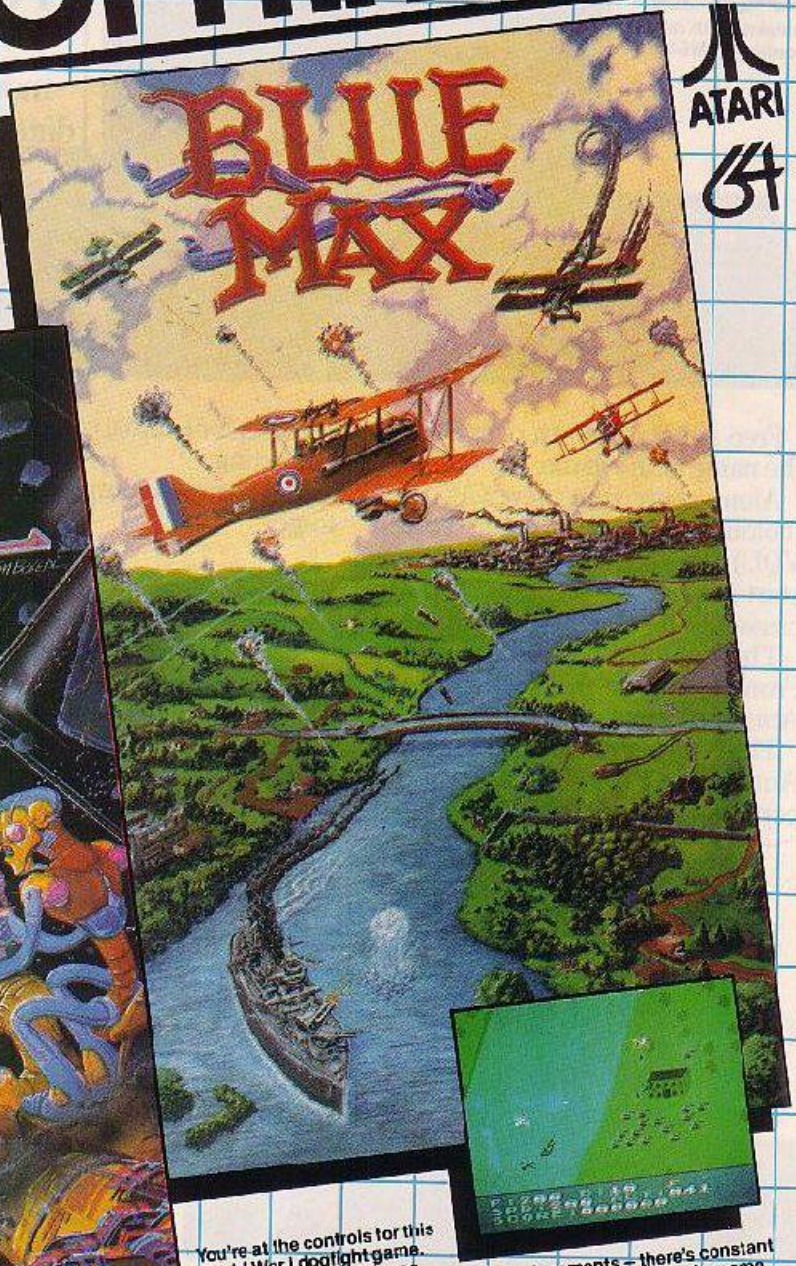
First World War Aerial Combat...
Fantastic 'Point of View' Arcade Action...
FLIGHTS OF FANTASY

ATARI 64

Exciting 3-D action makes SENTINEL the most realistic point-of-view game you've ever played. You're on a starship command deck with the latest in ultra-sophisticated computerised instrumentation. Use it to navigate through deadly asteroid belts, destroy enemy ships and track their battlestars through intergalactic minefields. Along the way you'll dock and refuel. It's tough duty but you've earned the command. Now can you prevent enemy forces from capturing your home planet? It's all in your hands.

Commodore 64.





You're at the controls for this World War I dogfight game. Shoot down enemy planes, bomb targets, strafe tanks and gun emplacements – there's constant action on the incredible 3-D diagonally scrolling screen. At the same time, you have to keep track of altitude, speed, fuel and damage. Medals don't come easy. You must master a series of flying skills and perform them with pinpoint accuracy. One slip and you've lost it all – even your life. Happy landings, ace!

Commodore 64 and Atari.

SELECTED TITLES AVAILABLE SOON FOR SPECTRUM

ALL GAMES

CASSETTE **£9.95**

DISK **£14.95**

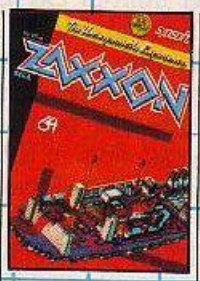
U.S. Gold Ltd., Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Tel: 021-359 3020.

U.S. GOLD All American Software

sysoft

A lively, imaginative alternative to rockets and bombs. Your Dreilb builds squares, his enemies knock them down. Quick reflexes, intelligence and strategy are a must.

Commodore 64 & Atari.

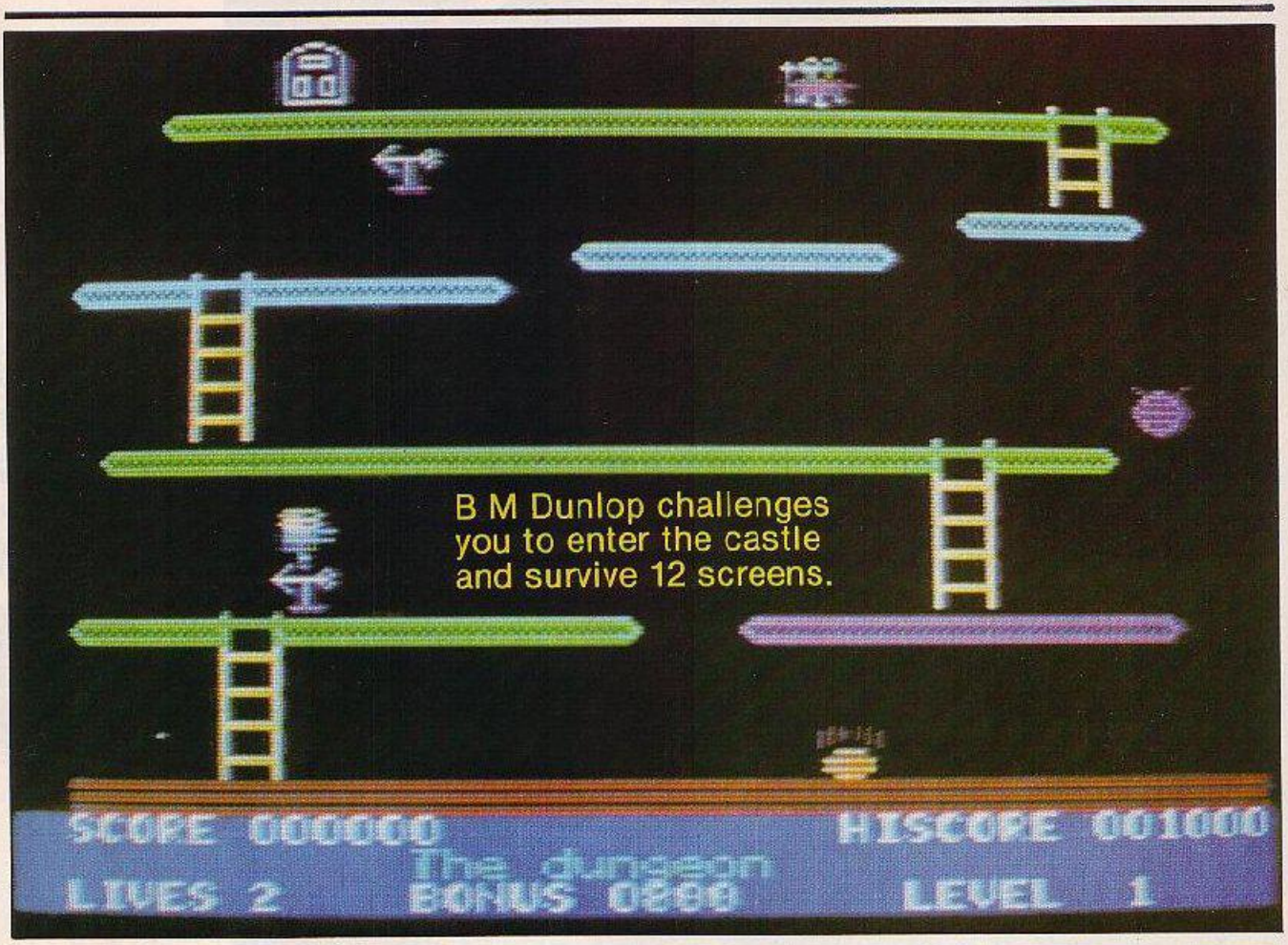


One of the most challenging arcade games available! Incredible 3-D graphics, diagonally scrolling screen, super sound – all in great detail.

Commodore 64.

A multi-level extravaganza! Fire on hazards; negotiate deadly caves; rescue friends! Features superb graphics, unnerving sounds and a constantly scrolling screen.

Commodore 64 & Atari.



CREEP CASTLE

CREEP CASTLE FOR Oric Atmos is a 12 screen platforms and ladders game with many different obstacles and hidden hazards to avoid. You have been thrown into the dungeon of the castle and you have to escape by reaching the door in the top left hand corner of each room. To help you escape you can move up, down, left, right and jump.

Five lives are given at the start of each game plus one extra should you complete all 12 screens. Once one screen has been completed you are awarded a number of points depending on how long you took. The Escape key can be used to end a game at any point if you are feeling suicical.

A record of the top 10 scores is stored minimum 1000 points — with the name of the scorers — maximum eight characters.

To enter the program, first type in listing 1 and save it on cassette with:

CSAVE"CASTLE",AUTO

Next, type

HIMEM7167

Listing 2.

```
10 INPUT'Start address ('S'to end)";A
$
20 IFA$='S'"THENENDELSEC=0:A=VAL("#"+A
$)
30 PRINTMID$(HEX$(A),2);
35 INPUTB$
40 IFB$='S'"THEN80
50 POKEA VAL("#"+B$)
60 A=A+1:C=C+VAL("#"+B$)
70 GOTO30
80 PRINT'CHECK"C
90 PRINT
100 GOTO10
```

then New and enter the machine-code loader — listing 2.

After listing 2 has been entered, type Run. The code in listing 3 can now be entered block by block. To do this, input the start address, then the numbers with a press of the Return key between each; enter S once a block has been completed. To help detect typing errors, the machine-code loader calculates the total sum of all the bytes in one block which can be compared with the number given at the end of each block in the listing.

If the two numbers are not equal, then there is an error and the block will have to be re-entered. This method of error detecting although not infallible will uncover most mistakes.

After the whole of listing 3 is finished, firstly, well done, and secondly, position the cassette directly after listing 1 and enter the following:

POKE 46080,96:CSAVE"CASTLE2",A46080,E47104,AUTO

POKE 6912,96:CSAVE"CASTLE3",A6192 E30720,AUTO

The game is now complete and runs automatically on

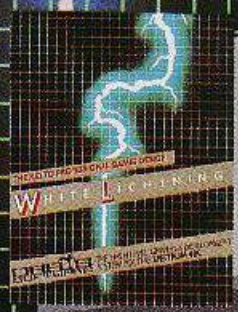
CLOAD"CASTLE"

I see no reason why the game should not also work on the 48K Oric-1 but if you have an Atmos then you may wish to record the "error ignorer" program, printed in the manual, before listing 1.

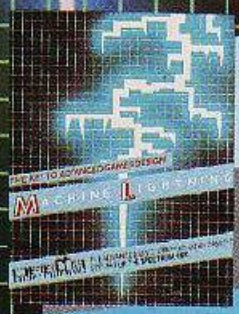
Listing 1.

```
10 REM CREEPY CASTLE - By M. Dunlop
60 PROGRAM(NK2):CLS:HIMEM167
30 CLOAD" :CLOAD
35 POKE#FA,#2000:POKE#4C,#2000:POKE
#FE,:FE3
40 DBUB=4000
27 POKE#67A5 0
40 D MH$(18),H$(10)
50 FORI=1TO10
60 H$(I)="ORIC":H%(I)=1000
70 NEXTI
80 LLS=(NK2):POKE#C0H,0:POKE#0035,0
90 PRINTSPC(6)"xxx xxx xxx xxx xxx x
x"
120 PRINTSPC(6)"x   x x x . x   x x x
x"
130 PRINTSPC(6)"x   xx  xxx xxx xxx
x"
122 PRINTSPC(6)"x   x x x   x   x
x"
136 PRINTSPC(6)"xxx x x xxx xxx x
x"
140 PRINT
150 PRINTSPC(6)"xxx  x  xxx xxx x   x
xx"
160 PRINTSPC(6)"x   x x x   x   x   x
x"
170 PRINTSPC(6)"x   x x xxx  x  x   x
xx"
180 PRINTSPC(6)"x   xxx   x  x  x   x
x"
190 PRINTSPC(6)"xxx x x xxx  x  xxx x
xx"
200 PRINT:PRINT" CHR$(27)"GWritten b
y Myles Dunlop"
205 PRINT:PRINT
```

(Listing 1 continued on page 79)



MICRODRIVE VERSION
available for transfer onto 3 cartridges.
Write even bigger programs faster.
(Upgrade your existing White Lightning for just £5)



MICRODRIVE COMPATIBLE

WHITE LIGHTNING

MACHINE LIGHTNING

LIGHTNING STRIKES TWICE

TWO HIGH POWERED GRAPHICS DEVELOPMENT SYSTEMS FOR THE SPECTRUM 48K.

OASIS SOFTWARE

White Lightning is a complete games writing system comprising a high level, Forth based, multi-tasking games writing language and a powerful Sprite Generator Program. No knowledge of machine code is required and the final machine code game, which can run independently of White Lightning, can be marketed with no restrictions whatsoever. Also, with the standard tape version programs can even be written in a combination of Forth and BASIC.

Up to 255 sprites, each with its own user defined dimensions, can be scrolled, spun, reflected, enlarged or inverted with amazing speed and smoothness. Sprites can even stretch across several screens to scrolling landscapes are easy to achieve. Sinclair's own sound and graphics commands such as CIRCLE, DRAW and BEEP are fully supported.

MULTI-TASKING Without doubt White Lightning's most innovative feature is its use of interrupts to effectively run two programs at once. This means that while one program smoothly scrolls a landscape in the background, a second can animate the characters.

SPRITE DESIGN White Lightning comes complete with a separate 20k program for developing sprites used in the main system. Not only can you use this to design your own sprites from scratch, it also comes complete with 68 pre-defined characters covering games like Asteroids, Pac-Man, Assault Course, Defender, Space Invaders, City Bomber, Lunar Lander, Frogger, Centipede, Donkey Kong and many, many more. These characters are ready to use or can be enhanced. And sprites can be saved to tape between editing sessions before being finally loaded into the main program.

Machine Lightning is an advanced games writing utility which includes a full Macro Assembler, a Monitor/Disassembler, a Sprite Generator Program and the object code for the White Lightning graphics routines which have almost 100 documented entry points in 3k of code. The comprehensive manual explains how to use two copies of the object code to run machine code routines concurrently using the Z80 interrupts. Games written using Machine Lightning can be marketed with no restrictions.

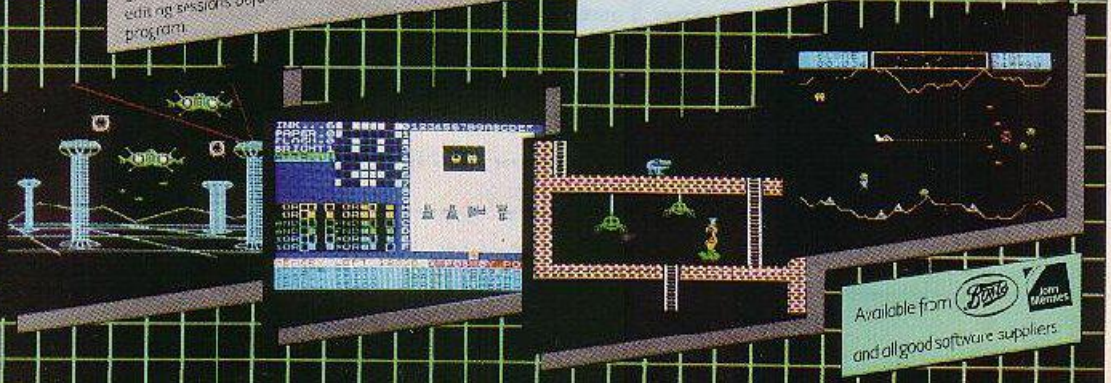
THE MACRO ASSEMBLER This is arguably the most comprehensive assembler yet available for the Spectrum 48k. It supports Macros, conditional assembly and a full screen editor, and occupies 16k of memory.

THE MONITOR/DISASSEMBLER As well as all the usual monitor features, Spectre-Mac allows up to 10 breakpoints in ROM or RAM, has front panel display and single stepping.

THE SPRITE GENERATOR This is the same Sprite Designer/Editor supplied with White Lightning and can be used to design up to 255 sprites, up to a maximum of 12k.

AND ... LOOK OUT FOR THE LIGHTNING **COMMODORE** SERIES

Basic Lightning, White Lightning and Machine Lightning, all available on tape or disk. Ask your local stockist for details, contact us direct or watch out for our advertisements.



Available from Boots, John Menzies and all good software suppliers

OASIS SOFTWARE
9a Alexandra Parade, Weston-super-Mare, Avon BS23 1QT Telephone: (0934) 419971
Every product carries a lifetime guarantee.
All prices include comprehensive manuals, VAT and p&p.
(includes manuals and p&p overseas)
24-hour Access
Telesordering on (0934 419921)

SU1

Please send me the following Lightning System Pack(s)

- ☐ White Lightning £14.95
- ☐ White Lightning (Microdrive) £19.95
- ☐ White Lightning (Microdrive Upgrade)* £5.00
- ☐ Machine Lightning £19.95

I enclose my cheque/P.O. for £ _____
(*plus my existing White Lightning Cassette)

Name _____

Address _____

Telephone _____

(listing 1 continued from page 77)

```
210 PRINT:PRINT" "CHR$(27)"FControls:
-
215 PRINT
220 PRINT" "CHR$(27)"CCursor left - l
eft"
230 PRINT" "CHR$(27)"ECursor right- r
ight"
240 PRINT" "CHR$(27)"BCursor down - d
own"
250 PRINT" "CHR$(27)"ACursor up   - u
p"
260 PRINT" "CHR$(27)"FSpace bar   - j
ump"
265 PRINT" "CHR$(27)"CESC         - e
nd game"
270 GOSUB1000
280 CLS:INK3:POKE#26A,10:POKE48035,0
290 PRINT:E$=CHR$(27):PRINTCHR$(4)E$"
J"E$"J"E$"A     MASTERS OF THE CASTLE"
CHR$(4)
300 PRINT:PRINT
310 FORI=1TO10
315 PLOT2,3+I*2,MID$(STR$(I),2)
320 S$=LEFT$("000000",7-LEN(STR$(H%(
I))))+MID$(STR$(H%(I)),2)
325 PLOT5,3+I*2,CHR$(RND(1)*7+1)+S$
330 PLOT17,3+I*2,"...."
340 PLOT30,3+I*2,H$(I):NEXTI
350 GOSUB1000
360 GOTO80
1000 PLOT1,25,CHR$(12)+CHR$(7)+"Press
SPACE to start"
1005 KK$=KEY$
1010 FORI=1TO5000
1020 IFKEY$=" "THEN2000
1030 NEXTI
1040 RETURN
2000 GOSUB10000
2090 WAIT150
2100 A$=LEFT$("000000",7-LEN(STR$(H%(
1))))+MID$(STR$(H%(1)),2)
2110 FORI=1TO6
2120 POKE#4:8-I,ASC(MID$(A$,I,1))-48
2130 NEXTI
2140 CALL#0750
2150 GOSUB3000:PLAY0,0,2,0:WAIT100
2160 TEXT:INK7:POKE#26A,10:POKE48035,
0
2170 PLOT10,11,"YOUR GAME IS OVER"
2180 WAIT150
2190 CLS
2200 A$=""
2210 FORI=#408TO#403STEP-1
2220 A$=A$+CHR$(PEEK(I)+48)
2230 NEXTI
2240 SC=VAL(A$)
2250 FORI=1TO10
2260 IFSC>H%(I)THEN2500
2270 NEXTI
2280 POP:GOTO280
2500 P=I:IFI=10THEN2540
2510 FORJ=9TOISTEP-1
2520 H%(J+1)=H%(J):H$(J+1)=H$(J)
2530 NEXTJ
2540 PLOT10,9,"Well done,"
2550 PLOT8,11,"you are now a master o
f"
2560 PLOT8,13,"the castle."
2570 PLOT8,15,"Please enter your name
"
2580 FORI=1TO17:PRINT:NEXT:PRINT">";:
N$=""
2590 GETX$:IFX$=CHR$(13)THEN2630
2595 IFASC(X$)<32THEN2600
2597 IFASC(X$)=127THENIFN$=""THEN2600
ELSEN$=LEFT$(N$,LEN(N$)-1):PRINTX$;:GO
TO2600
2610 N$=N$+X$:PRINTX$;
2620 IFLEN(N$)<9THEN2600
2630 H%(P)=SC:H$(P)=N$
2640 POP:GOTO280
3000 PLAY3,0,0,0
3010 FORI=10TO100STEP2
3020 SOUND1,I,10:SOUND2,200-I,10
3030 NEXTI
3040 RETURN
4000 I=PEEK(#E000)<>2THEN4500
4010 DOKE#7801,#F590
4020 DOKE#7004,#EC33
4030 DOKE#7807,#F1C8
4040 POKE#7800,#4C:POKE#7803,#4C:POKE
#7806,#4C
4050 RETURN
4500 DOKE#7801,#F535
4510 DOKE#7004,#E99A
4520 DOKE#7807,#EB1F
4530 GOTO4040
10000 REM ** PLAY TUNE **
10005 SOUND1,0,1
10010 PLAY1,0,0,0:RESTORE
10020 READ N,D:IFN=-1THENPLAY0,0,0,0:
RETURN
10030 MUSIC 1,3,N,12
10040 FORI=1TO3*D:NEXT
10050 GOTO10020
10060 DATA 1,50,5,50,8,50,1,50,5,50,8
,50
10070 DATA 8,30,6,50,2,50,1,70
10080 DATA -1,-1
```

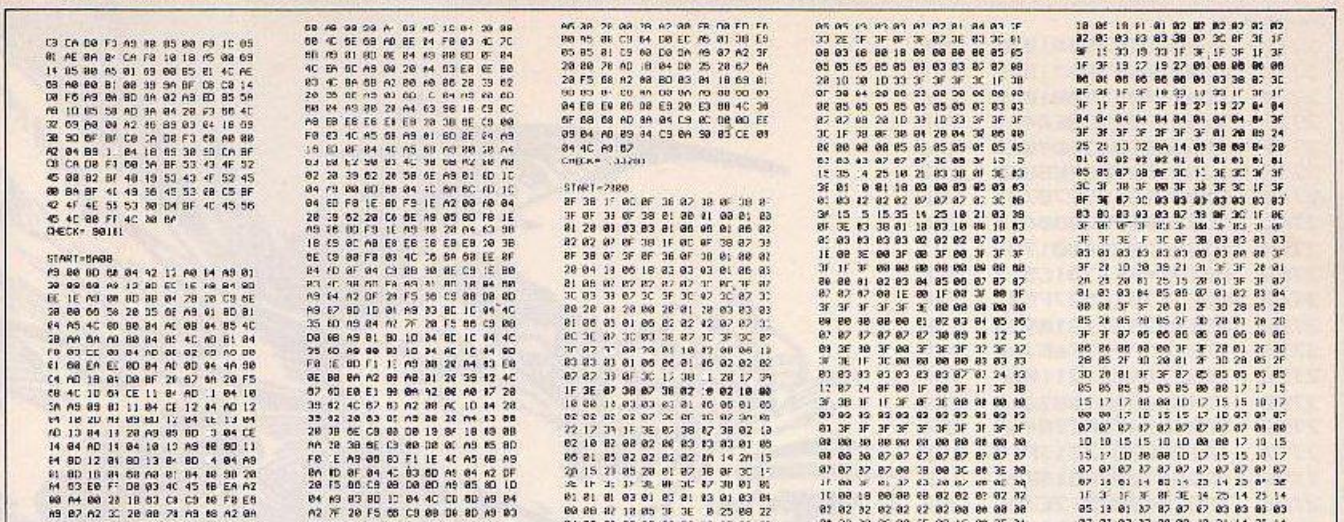
Listing 3.

```
START=1C00
02 20 20 54 68 65 20 64 75 6E 67
65 6F 6E 20 20 20 20 20 23 00 41
24 24 01 03 00 20 0F 00 23 71 00
65 20 62 75 67 73 20 14 05 20 20
4A 75 6D 70 69 6E 67 20 49 65 68
06 20 20 20 14 14 01 20 20 20 54
68 65 20 73 6E 66 66 66 20 20 20
20 20 14 14 02 20 20 48 6F 72 72
69 62 6C 65 70 6F 6F 6C 65 73 20
14 14 03 57 61 6E 64 65 72 69 6E
67 20 57 69 6C 6C 79 20 20 14 14
02 20 54 68 65 20 67 72 65 65 6E
20 6D 65 6E 20 20 20 14 14 0E 45
74 73 20 74 68 65 20 6D 75 6E 63
68 65 72 73 20 14 14 06 4E 6F 74
20 73 6F 20 68 61 72 64 77 61 72
65 20 20 14 14 01 54 68 65 20 62
75 67 67 65 64 20 62 79 74 65 73
20 14 14 02 20 20 20 54 68 65 20
74 6F 77 65 72 20 20 20 20 20 14
14 07 20 54 68 65 20 6C 61 73 74
20 65 78 69 74 20 20 20 14 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 01 06
01 40 3E 00 02 06 13 43 38 02 03
02 10 50 38 00 04 06 01 50 38 00
05 02 1C 70 38 02 FF
CHECK= 26572

START=1E20
06 01 FF 02 21 06 21 FF
CHECK= 591

START=1E30
02 14 01 05 04 05 FF
CHECK= 292

START=1E40
06 01 FF
CHECK= 262

START=1E50
06 2C 02 2C FF
CHECK= 351

START=1EE0
12 04 02 05 00 02 02 01 02 02 02
05 06 04 04 03 04 04 04 1E E4 04
00 00 00 20 00 00 20 00 20 00 00
00 07 07 00 00 40 80 03 00 00 02
00 00 03 00 00 00 00 00 00 00 0E
00 00 55 66 03 00 00 0A 0A 0A 0F
00 02 0A 0A 20 00 0A 0A 00 00 CF
2A 31 03 00 00 00 00 00 00 00 0E
00 30 03 08 0B 00 00 75 15 03 0E
00 30 03 0A 0C 00 00 00 00 0A 0E
0B 3C 03 00 FF
CHECK= 1705

START=2100
5A 34 01 00 00 00 00 00 00 00 02
00 30 03 00 07 07 00 00 6D 8D 03
00 30 03 00 09 09 00 00 00 00 02
00 30 03 00 00 3B 66 03 00 00 0F
0A 3A 0A 00 00 0A 0A 00 00 0A 0F
00 30 0F 2A 01 00 00 00 00 00 0E
00 30 03 00 00 00 08 28 00 00 48
15 00 00 00 00 00 00 0C 00 30 00
00 00 00 08 0C 00 02 FF
CHECK= 1494

START=2500
06 84 03 0E 00 00 00 0D 0E 00 00
00 00 00 0E 0D 0E 00 00 0C 0C 01
00 00 0F 1E 0F 10 0F 10 00 00 0F
10 0F 10 0F 10 0A 0C 03 0F 10 00
00 0F 10 0E 00 0F 10 00 00 0F 10
00 00 10 04 03 0D 0E 00 00 0D 0E
00 00 0D 0E 00 00 0D 0E 00 00 79
34 01 07 07 20 00 20 20 00 20 07
07 00 00 00 20 00 20 FF
CHECK= 1745

START=25EA
D5
CHECK= 213

START=2600
0A 04 03 00 00 00 00 13 14 00 20
00 00 30 00 11 12 00 00 0E 02 24
11 11 30 00 00 00 00 00 17 12 00
00 00 30 00 00 C6 04 03 15 16 15
16 15 16 15 16 15 15 15 16 15 16
15 16 3C 3C 03 00 00 00 00 17 17
00 00 20 03 00 00 18 18 00 00 46
16 03 20 03 00 00 17 17 00 00 00
00 00 00 19 18 00 00 FF
CHECK= 2305

START=2700
A2 7C 03 00 00 00 30 19 19 00 00
00 00 00 00 1A 1A 30 00 90 5E 02
00 00 00 00 1B 1B 30 03 00 00 00
02 1B 1B 00 02 3B 1C 04 1C 1D 00
02 1C 1D 00 00 1C 1D 03 00 1C 1D
0E 00 12 2C 04 00 20 03 00 1E 1F
0E 00 00 00 00 00 1E 1F 00 00 4E
15 03 20 20 00 00 20 72 00 00 70
26 00 00 20 20 00 00 FF
CHECK= 1904

START=2800
6D 90 02 E0 02 00 00 1B 1B 00 00
00 00 00 E0 1F 1B 00 00 70 70 01
00 00 00 E0 1F 1B 00 00 00 00 00
00 1B 1B E0 0F 4B 6B 02 00 00 30
00 1B 1B E0 0E 00 00 00 00 1B 1B
00 00 A2 4C 03 00 00 00 00 1B 1B
00 00 00 E0 0E 00 1B 1B 00 00 39
2A 01 00 E0 0E 00 21 21 00 00 30
00 00 00 21 21 00 00 FF
CHECK= 1938

START=2900
5A 90 24 00 00 00 00 1B 1E 00 00
00 00 00 00 1B 1B 00 E0 CC 50 02
21 21 00 00 21 21 00 E0 21 21 00
00 21 21 00 00 5B 6B 23 0E 00 00
00 21 21 00 00 00 00 E0 0E 21 21
00 00 AE 16 01 22 23 E0 0E 22 23
00 00 22 23 00 00 22 23 0E 00 40
5C 03 24 25 24 25 24 25 24 25 24
25 24 25 24 25 24 25 FF
CHECK= 2703

START=29C0
00
CHECK= 0

START=29C8
D5
CHECK= 213

START=29CE
D5
CHECK= 213

START=29FC
D5
CHECK= 213

START=2A00
3C 92 03 00 00 00 00 18 1A 00 00
E0 0E 00 00 1D 1D 00 30 7E 90 02
E0 0E 00 00 1B 1B 00 20 00 00 00
E0 1E 1B 00 00 AE 82 04 00 00 00
30 26 20 00 00 00 00 00 00 2F 2A
30 00 30 46 03 00 00 00 00 2E 28
30 00 00 00 00 00 25 25 00 00 8A
46 03 26 25 00 00 25 25 00 00 25
26 00 00 25 26 00 00 FF 46 03 25
25 00 00 26 25 00 00 25 26 00 00
26 23 00 00 FF
CHECK= 2330

START=2B00
2A 92 03 27 27 00 00 27 27 00 00
27 27 00 00 27 27 00 00 A0 50 01
00 00 00 00 29 29 00 00 00 00 00
00 29 29 00 00 3B 50 01 00 00 00
00 29 29 00 00 00 00 00 00 29 29
00 00 24 2E 03 00 00 00 00 2A 2A
00 00 00 00 00 03 2B 2B 00 00 DB
8C 02 28 28 00 02 00 00 00 00 28
28 00 00 00 00 00 00 FF
CHECK= 2213

START=2C00
2A 7A 03 2C 2C 00 00 2C 2C 00 00
2C 2C 00 00 2C 2C 00 00 90 79 04
2D 2D 00 00 2D 2D 00 00 2D 2D 00
00 2D 2D 00 00 00 00 02 2E 2E 00
00 00 00 00 00 2E 2E 00 00 00 00
00 00 32 24 02 00 00 00 00 1B 1B
00 00 00 00 00 00 1E 1B 00 00 66
24 03 00 00 00 00 1E 1B 00 00 00
00 00 00 1B 1B 00 00 FF
CHECK= 2347

START=2D00
BA 98 03 2F 30 00 00 2F 30 00 0E
2F 30 00 00 2F 30 00 00 3C 64 03
30 2F 00 00 30 2F 00 00 30 2F 00
00 30 2F 00 00 C6 64 04 31 32 00
00 31 32 00 00 31 32 00 00 31 32
00 00 31 42 01 00 00 00 00 1B 1B
00 00 00 00 00 00 1B 1B 00 00 40
13 03 03 00 00 00 32 31 00 00 00
00 30 03 32 31 00 00 FF
CHECK= 2226

START=2E00
BA 9C 05 00 00 00 00 2B 2C 00 00
00 00 03 00 0B AC 00 00 1B 6C 02
00 00 03 00 00 0C 00 00 00 00 00
00 00 03 00 00 30 70 02 00 00 00
00 21 21 00 00 00 00 00 00 21 21
00 30 3C 54 01 00 00 00 00 21 21
00 20 00 00 00 00 21 21 00 00 48
14 35 33 34 00 00 33 34 00 00 33
34 00 00 33 34 30 03 FF FF
CHECK= 2170

START=2F00
1E 94 24 00 00 00 00 35 35 30 03
00 00 00 06 35 35 00 00 A2 54 03
00 00 00 00 35 35 00 00 00 00 00
00 28 26 00 00 D2 35 03 00 00 00
00 35 36 00 00 00 00 00 00 35 36
00 00 66 29 01 00 00 00 00 1B 1B
00 00 00 00 00 00 1B 1B 00 00 46
14 04 00 00 00 00 35 35 00 00 00
00 00 00 35 35 00 00 FF
CHECK= 2183

START=315C
D5
CHECK= 213

START=3800
01 06 01 40 38 00 02 05 01 43 38
00 03 02 01 50 38 00 04 06 01 C0
38 00 05 02 01 70 38 00 FF
CHECK= 992

START=3810
06 01 FF 02 21 06 21 FF
CHECK= 591

START=3850
02 14 01 05 04 05 FF
CHECK= 292

START=3860
05 01 FF
CHECK= 262

START=3870
03 2C 02 2C FF
CHECK= 35

START=3900
01 08 01 40 39 00 02 01 01 60 39
02 03 04 01 80 39 00 04 02 01 A0
39 00 05 34 01 C0 39 00 FF
CHECK= 1217

START=3942
00 22 06 1C 02 3E FF
CHECK= 393

START=3960
05 05 01 05 02 09 03 05 07 05 06
09 FF
CHECK= 317

START=3980
06 0C 04 0C 02 0C 00 0C FF
CHECK= 315

START=39A0
02 0A 02 14 00 1C 02 14 04 0F 02
10 04 0D FF
CHECK= 401

START=39C0
00 2C 04 2C FF
CHECK= 347

START=39CA
D5
CHECK= 213

START=39D0
F5 D5
CHECK= 458

START=39D6
D5
CHECK= 213

START=39DC
D5
CHECK= 213

START=39E2
D5
CHECK= 213

START=39E8
D5
CHECK= 213

START=39EE
D5
CHECK= 213

START=39F4
D5
CHECK= 213

START=3A00
01 06 01 40 3A 00 02 00 01 60 3A
00 03 06 01 80 3A 00 04 06 01 C0
3A 00 05 02 01 E0 3A 00 FF
CHECK= 1289

START=3A40
02 38 06 38 FF
CHECK= 375

START=3A60
04 14 00 14 FF
CHECK= 288

START=3A80
02 04 06 04 07 00 05 05 06 09 00
0A 00 0C 07 09 00 09 02 00 03 03
02 0C 04 0A 02 09 01 05 03 08 FF
05 03 08 FF
CHECK= 708

START=3AC0
02 2C 03 2C FF
CHECK= 351

START=3AE0
06 16 02 16 FF
CHECK= 307

START=3B00
01 02 01 40 3B 00 02 02 01 60 3B
00 03 02 01 80 3B 00 04 02 01 A0
3B 00 05 00 01 C0 3B 00 FF
CHECK= 1218

START=3B40
06 14 02 14 FF
CHECK= 303

START=3B60
06 0F 02 0F FF
CHECK= 283

START=3B80
06 07 02 07 04 09 00 09 02 28 09
05 04 00 00 09 FF
CHECK= 341

START=3BA0
06 1D 02 1D FF
CHECK= 321

START=3BC0
04 06 00 06 02 0A 04 02 00 02 06
0A FF
CHECK= 302

START=3C00
01 02 01 40 3C 00 02 02 01 60 3C
00 03 02 01 80 3C 00 04 02 01 A0
3C 00 05 02 01 C0 3C 00 FF
CHECK= 1225

START=3C40
06 14 02 14 FF
CHECK= 303

START=3C60
06 1E 02 1E FF
CHECK= 323

START=3C80
06 0F 02 0F FF
CHECK= 293

START=3CA0
0E 08 02 08 FF
CHECK= 279

START=3CC0
06 3C 02 3C FF
CHECK= 383

START=3D00
01 02 01 40 3D 00 02 06 01 60 3D
00 03 02 01 80 3D 00 04 06 01 A0
3D 00 05 04 01 C0 3D 00 FF
CHECK= 1240

START=3D40
06 09 02 09 FF
CHECK= 291

START=3D60
02 0A 06 0A FF 05 06 05 02 05 04
05 FF
CHECK= 570

START=3D80
06 13 02 13 FF
CHECK= 30

START=3DA0
02 1E 06 1E FF 09 05 1E 02 1E 00
09 FF
CHECK= 664

START=3DC0
02 03 05 03 07 04 05 04 06 04 00
0A 02 10 00 0D 04 0D 06 10 04 0A
02 04 01 34 03 04 FF
CHECK= 411

START=3E00
E1 02 01 00 3E 00 02 32 01 80 3E
E0 03 00 01 A0 3E 00 24 02 01 C0
3F 00 05 02 01 E0 3E 20 FF 02 01
E0 3E 00 FF
CHECK= 1543
```

(listing 3 continued on page 80)

(continued from previous page)

```
START=3E40
02 9C 00 9C FF
CHECK= 575

START=3E50
00 0E 02 0E FF
CHECK= 291

START=3E60
00 15 02 15 FF
CHECK= 385

START=3E70
02 1B 00 1B FF
CHECK= 317

START=3E80
00 1D 02 1D FF
CHECK= 295

START=3E90
00 09 02 01 00 04 04 04 FF
CHECK= 295

START=3F00
01 02 01 49 3F 00 02 00 01 00 3F
00 03 02 01 A0 3F 00 04 02 01 C0
3F 00 05 00 01 E0 3F 00 FF
CHECK= 1370

START=3F40
00 0A 02 0A 00 05 02 10 14 03 02
0A 05 0A 00 03 00 10 04 05 FF
CHECK= 375

START=3F80
00 2A 02 2A 24 10 00 10 04 10 00
10 02 10 00 10 02 10 00 10 FF
CHECK= 515

START=3FB0
02 2E 00 2E FF
CHECK= 355

START=3FA0
00 2E 02 2E FF
CHECK= 355

START=3FC0
00 24 02 24 FF
CHECK= 335

START=3FE0
04 0F 00 01 FF
CHECK= 289

START=4000
01 00 01 42 40 00 02 00 01 00 40
00 03 04 0. 00 10 00 05 01 00
40 00 05 00 01 10 40 00 FF
CHECK= 1201

START=4040
02 00 00 00 00 12 02 1C 00 1C 00
12 FF
CHECK= 379

START=4080
00 01 00 01 00 00 00 04 00 FF
CHECK= 389

START=40B0
00 10 04 10 FF
CHECK= 307

START=40A0
02 0D 00 0C FF
CHECK= 289

START=40C0
02 00 00 0C FF
CHECK= 275

START=4100
01 00 01 42 41 00 02 02 01 00 41
03 03 05 01 00 41 00 04 C2 01 C0
41 00 05 02 01 10 41 00 FF
CHECK= 1555

START=4140
02 0C 00 0C 00 07 00 14 04 07 00
0C 02 0C 00 07 02 14 04 07 FF
CHECK= 483

START=4180
00 0C 02 0C 04 07 02 14 01 07 02
0C 00 0C 04 07 00 14 00 07 FF
CHECK= 403

START=41A0
02 03 00 03 00 04 00 0C 04 04 00
03 00 04 00 0C 04 04 00 03 02 03
00 04 02 0C 00 04 04 02 03 00 04 02
0C 04 04 FF
CHECK= 489

START=41C0
00 20 02 20 FF
CHECK= 303

START=41E0
04 20 02 20 FF
CHECK= 327

START=4200
01 06 41 40 42 00 07 07 01 00 42
00 03 42 01 00 42 00 04 02 01 A0
42 00 05 02 01 C0 42 00 FF
CHECK= 1259

START=4240
01 1C 00 1C FF
CHECK= 319

START=4280
00 2D 02 2D FF
CHECK= 353

START=42B0
00 0E 02 0E FF
CHECK= 291

START=42A0
00 10 02 10 FF
CHECK= 311

START=42C0
00 06 02 00 04 00 00 14 02 10 04
00 00 00 05 10 02 14 00 00 FF
CHECK= 423

START=4300
01 02 01 40 43 00 02 02 01 60 43
00 03 00 01 10 43 00 04 02 01 A0
43 00 05 02 01 C0 43 00 FF
CHECK= 1284

START=4340
00 2C 02 2C FF
CHECK= 351

START=4350
00 0 02 10 FF
CHECK= 295

START=4360
00 0 02 10 FF
CHECK= 295

START=4370
00 24 02 24 FF
CHECK= 335

START=4310
00 0 02 10 FF
CHECK= 311

START=4390
FE 09 02 20 01 20 01 FE 00 03 20
01 27 01 FE 00 04 00 0 20 01 21
00 20 01 FE 14 04 01 01 20 01 21
0. 24 01 25 01 11 01 23 01 FE 15
00 00 01 24 01 25 01 FE 16 00 05
0. 24 01 25 01 FE 04 02 0. 01 20
0. 21 04 20 04 21 00 23 0. FE 1C
04 02 01 2B 01 24 01 25 0. 23 01
FE 22 00 01 01 20 01 21 02 23 01
FE 10 00 05 01 24 01 25 0. FE 10
00 05 01 24 01 25 01 FE 10 00 25
0. 24 01 25 01 FE 10 00 05 01 24
01 25 01 FE 10 13 02 01 24 01 21
02 23 01 FE 0E 12 02 01 20 01 21
02 23 01 FE 05 14 02 01 20 01 21
01 24 01 25 01 21 01 23 0. FE 17
15 05 01 24 01 25 01 FE 01 10 35
01 24 01 25 01 FE 02 15 00 01 24
01 25 01 FE 01 10 03 01 20 0. 26 FF
CHECK= 8598

START=5510
FE 00 02 20 01 25 01 FE 00 03 20
01 27 01 FE 02 04 00 01 20 01 21
02 23 01 FE 12 00 00 01 20 01 21
00 23 01 FE 1A 07 00 01 20 01 24
01 25 01 23 01 FE 10 00 05 01 24
01 25 01 FE 10 00 05 01 24 01 25
01 FE 03 0A 00 01 20 01 24 01 25
01 21 .7 23 01 FE 04 00 05 01 24
01 25 01 FE 04 0C 05 01 24 01 25
01 FE 04 0D 05 01 24 01 25 01 1E
04 0E 05 01 24 00 25 01 FE 04 0F
00 01 24 01 25 00 FE 04 10 05 01
24 00 15 01 FE 04 11 05 01 24 01
25 00 FE 03 12 05 01 20 01 23 03
23 01 1F 1F 17 00 01 20 01 21 01
24 01 25 01 21 00 23 01 FE 21 .3
00 01 24 01 25 00 FE 21 14 05 01
24 01 25 01 FE 25 15 05 01 24 01
20 01 FE 21 16 05 01 24 01 25 01
FE 21 17 00 01 24 01 25 01 FE 01
1E 03 01 20 26 FF
CHECK= 9128

START=58A0
FC 00 02 20 01 23 01 FE 00 03 20
01 27 01 FE 00 04 03 01 20 01 21
03 24 01 25 01 FE 0A 05 00 01 24
01 25 01 FE 0A 05 00 01 24 01 25
01 FE 0A 07 00 01 24 01 25 01 FE
0A 00 00 01 24 01 25 01 FE 01 09
03 01 20 01 24 01 25 01 FE 01 0B
01 FE 02 0A 00 01 24 01 25 01 FE
02 00 00 01 24 01 25 01 FE 02 0C
00 01 24 01 25 01 FE 02 0D 00 01
20 01 24 01 25 01 FE 02 0E 00 01
20 01 24 01 25 01 FE 03 0F 00 01
20 01 24 01 25 01 FE 03 10 00 01
20 01 24 01 25 01 FE 03 11 00 01
20 01 24 01 25 01 FE 03 12 00 01
24 01 25 01 FE 03 14 02 01 20 01
25 00 FE 01 15 01 01 20 01 21 1E
24 01 25 01 23 01 FE 20 16 02 01
24 00 25 01 FE 20 17 02 01 20 01
25 01 FE 01 18 00 01 20 26 FF
CHECK= 23839

START=5A00
FE 00 02 20 01 23 01 FE 00 03 20
01 27 01 FE 00 04 00 01 20 01 21
14 24 01 25 0. 23 01 FE 1B 05 01
01 24 01 25 0. FE 10 00 05 01 24
01 25 01 FE 10 07 01 01 24 01 25
01 FE 10 00 0. 24 01 24 01 25 01
03 00 03 01 20 01 24 01 25 01 21
01 23 01 FE 04 09 01 01 24 01 25
01 FE 04 0A 0. 01 24 01 25 01 FE
04 00 01 01 24 01 25 01 FE 02 0C
00 01 20 01 2. 05 23 01 FE 0F 0C
03 01 20 01 2. 02 23 01 FE 19 0C
00 05 20 01 2. 02 23 01 FE 0A 0E
00 01 20 01 2. 02 23 01 FE 1A 0E
00 05 00 01 2. 02 23 01 FE 17 0C
00 01 20 01 2. 02 23 01 FE 15 0C
00 01 FE 22 0F 0. 01 24 01 25 01 FE
22 12 01 01 24 01 25 01 FE 22 11
01 01 24 01 25 01 FE 05 12 05 01
20 01 24 01 23 01 21 04 23 01 FE
11 12 03 01 20 01 21 04 23 01 FE
1C 12 00 01 20 01 21 05 24 01 25
01 21 01 23 01 FE 05 13 01 01 24
01 25 01 FE 00 14 01 01 24 01 25
01 FE 00 15 01 01 24 01 25 01 FE
00 15 01 01 24 01 25 01 FE 05 17
01 01 24 01 25 01 FE 00 18 05 01
20 26 FF
CHECK= 11599

START=51F0
FE 00 02 20 01 20 01 FE 00 03 20
01 27 01 FE 02 04 02 01 20 01 21
00 23 01 FE 10 04 00 01 20 01 21
01 23 01 FE 21 05 01 01 20 01 21
02 23 01 FE 16 07 02 01 20 01 21
02 21 01 FE 21 09 01 01 20 01 24
01 25 01 23 01 FE 22 00 03 01 24
01 20 01 FE 22 00 03 01 24 01 25
01 FE 22 0C 03 01 24 01 25 01 FE
22 00 03 01 24 01 25 01 FE 22 0F 03 01
24 01 25 01 FE 20 10 02 01 21 01
21 01 23 01 FE 02 00 01 01 24 01
24 01 25 01 21 00 24 01 25 01 23
01 FE 03 00 03 01 24 01 25 00 FE
03 0C 03 01 24 01 25 01 FE 03 00
03 01 24 01 25 01 FE 03 0E 03 01
24 01 25 01 FE 03 0F 03 01 24 01
25 01 FE 03 10 03 01 24 01 25 01
FE 11 00 03 01 24 01 25 01 FE 11
0C 03 01 24 01 25 01 FE 11 02 03
01 24 01 25 01 FE 11 00 03 01 24
01 25 01 FE 11 0F 03 01 24 01 25
01 FE 11 10 03 01 24 01 25 01 FE
01 11 01 01 20 01 21 01 24 01 25
01 23 01 FE 0F 1 02 01 20 01 21
0. 23 01 FE 05 2 03 01 24 01 25
01 FE 05 13 03 01 24 01 25 01 FE
05 14 03 01 24 01 25 01 FE 05 15
01 01 24 01 25 01 FE 05 15 03 01
24 01 25 01 FE 05 17 03 01 24 01
25 01 FE 01 18 05 01 20 25 FF
CHECK= 13935

START=5D00
FE 00 02 20 01 20 01 FE 00 03 20
0. 27 01 FE 01 04 01 01 20 01 21
00 23 01 FE 14 04 01 01 20 01 21
0. 24 01 25 01 11 01 23 01 FE 15
00 00 01 24 01 25 01 FE 16 00 05
0. 24 01 25 01 FE 04 02 0. 01 20
0. 21 04 20 04 21 00 23 0. FE 1C
04 02 01 2B 01 24 01 25 0. 23 01
FE 22 00 01 01 20 01 21 02 23 01
FE 10 00 05 01 24 01 25 0. FE 10
00 05 01 24 01 25 01 FE 10 00 25
0. 24 01 25 01 FE 10 00 05 01 24
01 25 01 FE 10 13 02 01 24 01 21
02 23 01 FE 0E 12 02 01 20 01 21
02 23 01 FE 05 14 02 01 20 01 21
01 24 01 25 01 21 01 23 0. FE 17
15 05 01 24 01 25 01 FE 01 10 35
01 24 01 25 01 FE 02 15 00 01 24
01 25 01 FE 01 10 03 01 20 0. 26 FF
CHECK= 8598

START=5510
FE 00 02 20 01 23 01 FE 00 03 20
01 27 01 FE 02 04 00 01 20 01 21
02 23 01 FE 12 00 00 01 20 01 21
00 23 01 FE 1A 07 00 01 20 01 24
01 25 01 23 01 FE 10 00 05 01 24
01 25 01 FE 10 00 05 01 24 01 25
01 FE 03 0A 00 01 20 01 24 01 25
01 21 .7 23 01 FE 04 00 05 01 24
01 25 01 FE 04 0C 05 01 24 01 25
01 FE 04 0D 05 01 24 01 25 01 1E
04 0E 05 01 24 00 25 01 FE 04 0F
00 01 24 01 25 00 FE 04 10 05 01
24 00 15 01 FE 04 11 05 01 24 01
25 00 FE 03 12 05 01 20 01 23 03
23 01 1F 1F 17 00 01 20 01 21 01
24 01 25 01 21 00 23 01 FE 21 .3
00 01 24 01 25 00 FE 21 14 05 01
24 01 25 01 FE 25 15 05 01 24 01
20 01 FE 21 16 05 01 24 01 25 01
FE 21 17 00 01 24 01 25 01 FE 01
1E 03 01 20 26 FF
CHECK= 9128

START=58A0
FC 00 02 20 01 23 01 FE 00 03 20
01 27 01 FE 00 04 03 01 20 01 21
03 24 01 25 01 FE 0A 05 00 01 24
01 25 01 FE 0A 05 00 01 24 01 25
01 FE 0A 07 00 01 24 01 25 01 FE
0A 00 00 01 24 01 25 01 FE 01 09
03 01 20 01 24 01 25 01 FE 01 0B
01 FE 02 0A 00 01 24 01 25 01 FE
02 00 00 01 24 01 25 01 FE 02 0C
00 01 24 01 25 01 FE 02 0D 00 01
20 01 24 01 25 01 FE 02 0E 00 01
20 01 24 01 25 01 FE 03 0F 00 01
20 01 24 01 25 01 FE 03 10 00 01
20 01 24 01 25 01 FE 03 11 00 01
20 01 24 01 25 01 FE 03 12 00 01
24 01 25 01 FE 03 14 02 01 20 01
25 00 FE 01 15 01 01 20 01 21 1E
24 01 25 01 23 01 FE 20 16 02 01
24 00 25 01 FE 20 17 02 01 20 01
25 01 FE 01 18 00 01 20 26 FF
CHECK= 23839

START=5A00
FE 00 02 20 01 20 01 FE 00 03 20
01 27 01 FE 00 04 00 01 20 01 21
14 24 01 25 0. 23 01 FE 1B 05 01
01 24 01 25 0. FE 10 00 05 01 24
01 25 01 FE 10 07 01 01 24 01 25
01 FE 10 00 0. 24 01 24 01 25 01
03 00 03 01 20 01 24 01 25 01 21
01 23 01 FE 04 09 01 01 24 01 25
01 FE 04 0A 0. 01 24 01 25 01 FE
04 00 01 01 24 01 25 01 FE 02 0C
00 01 20 01 2. 05 23 01 FE 0F 0C
03 01 20 01 2. 02 23 01 FE 19 0C
00 05 20 01 2. 02 23 01 FE 0A 0E
00 01 20 01 2. 02 23 01 FE 1A 0E
00 05 00 01 2. 02 23 01 FE 17 0C
00 01 20 01 2. 02 23 01 FE 15 0C
00 01 FE 22 0F 0. 01 24 01 25 01 FE
22 12 01 01 24 01 25 01 FE 22 11
01 01 24 01 25 01 FE 05 12 05 01
20 01 24 01 23 01 21 04 23 01 FE
11 12 03 01 20 01 21 04 23 01 FE
1C 12 00 01 20 01 21 05 24 01 25
01 21 01 23 01 FE 05 13 01 01 24
01 25 01 FE 00 14 01 01 24 01 25
01 FE 00 15 01 01 24 01 25 01 FE
00 15 01 01 24 01 25 01 FE 05 17
01 01 24 01 25 01 FE 00 18 05 01
20 26 FF
CHECK= 11599

START=51F0
FE 00 02 20 01 20 01 FE 00 03 20
01 27 01 FE 02 04 02 01 20 01 21
00 23 01 FE 10 04 00 01 20 01 21
01 23 01 FE 21 05 01 01 20 01 21
02 23 01 FE 16 07 02 01 20 01 21
02 21 01 FE 21 09 01 01 20 01 24
01 25 01 23 01 FE 22 00 03 01 24
01 20 01 FE 22 00 03 01 24 01 25
01 FE 22 0C 03 01 24 01 25 01 FE
22 00 03 01 24 01 25 01 FE 22 0F 03 01
24 01 25 01 FE 20 10 02 01 21 01
21 01 23 01 FE 02 00 01 01 24 01
24 01 25 01 21 00 24 01 25 01 23
01 FE 03 00 03 01 24 01 25 00 FE
03 0C 03 01 24 01 25 01 FE 03 00
03 01 24 01 25 01 FE 03 0E 03 01
24 01 25 01 FE 03 0F 03 01 24 01
25 01 FE 03 10 03 01 24 01 25 01
FE 11 00 03 01 24 01 25 01 FE 11
0C 03 01 24 01 25 01 FE 11 02 03
01 24 01 25 01 FE 11 00 03 01 24
01 25 01 FE 11 0F 03 01 24 01 25
01 FE 11 10 03 01 24 01 25 01 FE
10 01 01 24 01 25 01 FE 19 1 05
01 20 01 21 01 24 01 25 01 2 07
FE 11 12 01 01 24 01 25 01 FE 1E
13 01 01 24 01 25 01 FE 1C 14 02
01 21 08 FE 16 15 02 01 21 01 FE
10 16 00 01 21 00 FC 01 10 01 01
20 2C FF 01 20 26 FF 26 FF
CHECK= 13858

START=5850
FC 00 02 20 01 23 01 FE 00 03 20
01 27 01 FE 04 04 01 01 20 01 21
10 24 01 25 01 21 01 23 01 FE 15
05 00 01 24 01 25 01 FE 15 01 02
01 24 01 25 01 FE 15 02 02 01 24
01 2C 01 1E 15 08 02 01 24 01 25
01 FE 02 09 01 01 20 01 21 01 24
01 23 01 11 15 23 01 FE 04 0F 02
01 24 01 25 01 FE 04 0B 02 01 24
01 25 01 FE 03 0C 01 01 20 01 21
05 23 01 FE 00 0D 0. 01 20 01 21
05 24 01 25 01 21 0. 23 01 FE 13
0E 02 01 24 01 25 0. FE 13 0F 02
01 24 01 25 01 FE 13 10 02 01 24
01 25 01 FE 0D 11 0. 01 20 01 21
01 20 03 21 01 23 0. FE 10 12 01
01 20 01 21 00 24 0. 25 01 23 01
FE 24 13 02 01 24 0. 25 01 FE 24
14 02 01 24 01 25 0. FE 24 15 02
01 24 01 25 01 FE 0. 14 00 01 20
01 21 07 23 01 20 01 20 01 21 0F
23 01 FE 12 10 01 0. 20 01 21 03
23 01 FE 01 18 02 0. 2A 26 FF
CHECK= 9578

START=5CE0
FE 00 02 20 01 20 01 FE 00 03 20
01 27 01 FE 04 04 05 01 22 01 21
02 23 01 20 05 01 23 01 24 01
25 01 21 00 23 01 FE 10 05 00 01
24 01 25 01 FE 10 06 00 01 24 01
25 01 FE 10 07 00 01 24 01 25 01
FE 10 08 00 01 24 01 25 01 FE 0E
00 00 01 22 01 20 25 01 FE 10
0A 03 01 22 01 21 03 23 01 FE 1E
0B 03 01 22 01 21 04 24 01 25 01
23 01 FE 23 0C 06 01 24 01 25 01
FE 23 00 00 01 24 01 25 01 FE 23
4E 00 01 24 01 25 01 FE 23 0F 00
01 24 01 25 01 FE 1F 10 03 01 22
01 21 05 23 01 FE 10 0F 03 01 22
01 21 02 23 01 FE 02 0E 03 01 22
01 21 02 24 01 25 01 21 00 23 01
FE 05 0F 00 01 24 01 25 01 FE 05
10 00 01 24 01 25 01 FE 05 11 00
01 24 01 25 01 FE 02 06 01 24
01 25 01 FE 01 13 00 01 12 01 21
00 24 01 25 01 21 00 23 01 FE 0F
14 00 01 24 01 25 01 FE 0C 15 00
01 24 01 25 01 FE 0C 16 00 01 24
01 25 01 FE 0C 17 00 01 24 01 25
01 FE 01 13 02 01 2F 26 FF
CHECK= 10070

START=5E70
FE 00 02 23 01 29 01 FE 00 03 20
01 27 01 FE 04 04 02 01 12 01 21
10 24 01 23 01 21 01 23 01 FE 2A
05 03 01 24 01 25 01 FE 10 00 03
01 24 01 23 01 FE 1C 07 10 01 22
01 21 04 23 01 FE 11 00 10 01 22
01 21 00 21 01 FE 01 09 00 01 22
01 21 03 24 01 25 01 21 47 23 01
FE 05 0A 03 01 24 01 25 01 FE 05
EB 03 01 24 01 25 01 FE 45 0C 03
01 24 01 23 01 FE 05 0D 03 01 24
01 25 01 FE 02 0E 02 01 12 01 21
10 24 01 24 01 21 03 23 01 FE 1C
0F 03 01 24 01 25 01 FE 1C 10 03
01 24 01 23 01 FE 1C 11 03 01 24
01 25 01 FE 1C 12 03 01 24 01 25
01 FE 01 13 02 01 22 01 21 04 24
01 25 01 21 0A 23 01 20 02 05 01
22 01 21 0C 23 01 FE 0B 14 03 01
24 01 25 01 FE 05 15 03 01 24 01
25 01 FE 00 16 03 01 24 01 25 01
FE 00 17 03 01 24 01 25 01 FE 01
18 01 01 20 26 FF
CHECK= 9373

START=5F00
F0 00 04 0E 01 04 AC 02 E4 85 A0
48 98 40 8A 48 90 FA 04 E5 42 A0
F8 24 85 41 C8 45 F0 10 18 A5 42
C9 24 85 42 A5 43 69 00 C5 43 A0
10 D0 09 04 85 14 D0 0D 18 45 C8
F9 20 85 43 00 10 10 18 A5 44 C9
38 85 44 A5 45 38 20 85 45 4C 38
00 0A A0 01 38 10 30 90 24 C8 4C
51 00 18 03 85 35 42 84 48 84 A0
A5 44 85 42 A5 45 85 41 F9 0C 85
40 A2 02 A5 47 20 1D A4 48 B1 42
A4 48 09 41 91 10 E6 48 E6 49 A4
48 B1 42 A4 48 35 48 91 40 E6 49
4C C8 00 A4 49 31 42 28 F0 00 E0
02 D0 09 A4 48 39 48 91 40 4C 0C
00 A4 48 11 40 31 48 E6 49 A4 49
B1 42 E6 49 20 24 01 A4 48 09 40
91 42 C4 D0 D2 A5 49 85 48 18 A5
48 69 20 85 40 A5 41 A4 00 85 41
C5 48 D0 0A C6 48 A2 0C A4 49 B1
42 E6 49 A4 48 31 44 10 A5 44 69
20 85 44 A5 45 09 00 85 45 C0 00
E5 00 A4 00 B0 00 A4 47 C0 01
F0 11 C0 02 F0 0F C0 03 F0 0B C0
04 F0 0E C0 05 F0 0F C0 06 A0 00
49 00 4A 4A 90 00 4A 4A 4A 4A 00
41 A0 4A 4A 4A 00 48 A9 00 38 E5
47 A8 C8 C0 01 F0 11 C0 02 F0 11
C0 03 F0 11 C0 04 F0 14 C0 05 F0
12 C0 06 29 3F 00 0A 0A 29 3F 00
05 0A 0A 29 3F 00 0A 0A 0A 0A 29
3F 00 0A 0A 0A 0A 29 3F 00 A0
03 24 4E 01 04 4C 02 84 45 48 48
91 40 84 4E 20 E5 01 A9 0C 85 48
A5 4A 85 4E A2 04 A4 4E 01 48 16
48 A4 49 31 42 18 49 C8 D0 F1 18
A5 40 69 21 85 40 A5 41 00 00 85
41 C0 48 D0 D0 38 A4 00 A8 00 00
A0 00 04 AE 01 24 AC 02 04 85 40
A5 48 69 0F 48 20 E5 01 A0 0C 85
A5 4A 85 4E 42 04 A4 49 B1 42
E3 49 A4 4E 91 40 E6 48 C0 D0 F1
A4 40 F0 06 85 48 A5 41 00 00
05 41 C6 4E D0 0A A8 00 A9 00
00 A9 00 85 48 A9 A8 85 41 C0 D0
F4 10 18 AC 48 69 20 85 40 A5 41
69 00 85 41 4C EE 01 A0 00 0A 38
E3 00 90 04 C6 41 80 02 C0 04 A0
A0 FC 04 85 42 A0 F0 04 85 43 C0
45 30 10 A5 42 10 69 30 85 42 A5
43 4D 00 05 49 4C 1A 02 A9 00 85
49 48 AE 00 04 AC 01 04 A0 48 4B
98 48 B0 53 00 54 A0 FE 04 85 4D
A0 FF 04 85 4E E8 53 C6 53 F0 10
10 A5 4D 69 13 85 4D A5 4E 69 00
85 4E 4C 4E 02 04 52 A9 00 01 4D
85 4F C8 B1 4D 85 50 A6 4F 44 50
A5 54 20 A0 01 A0 02 B1 4D 85 51
A5 52 20 A0 00 05 63 10 85 4F 85
4F 10 B9 85 60 10 85 56 85 50 20
D4 E2 C8 51 00 E4 A0 00 A5 4F 91
4D 10 A5 50 91 4D A5 54 A0 4F A4
50 10 00 01 E5 4C A5 41 A0 90 B9
A4 52 B9 F0 02 A0 4C C1 02 A4 52
B9 F0 02 A0 C3 B1 4D A4 4F A4 50
20 69 00 60 A9 00 98 61 60 A5 4F
C9 C0 90 0F C9 E4 B0 1E A5 50 C9
FF F0 0F C9 B1 B0 10 04 A9 E3 85
4F C8 A9 00 01 4F 50 A5 E0 15 50
09 F0 00 65 52 00 30 00 07 C0 00
00 0F 11 00 F7 01 FF 01 00 01 01
00 01 FF 01 FF 00 FF FF AE E1 04
AC 02 84 0A 48 98 48 04 59 A0 FE
04 85 4D A0 FF 04 95 4E E8 CA F0
10 10 A5 4D 60 19 85 4C A5 4C 69
00 85 4E 4C 2C 63 90 00 11 4D 85
55 D8 B1 4D 85 56 34 55 C8 A0 FE
04 85 4D A0 FF 04 35 4E 88 F0 10
10 A5 4D 69 13 85 4D A5 4E 69 00
85 4E 4C 57 03 B1 4D 85 57 C8 B1
4D 85 58 A5 55 38 E5 57 C9 80 90
B4 C9 F3 90 17 A5 38 38 E5 58 C9
0C 90 04 C9 F5 90 0A A8 A8 09 AA
A9 01 00 00 84 D0 38 A8 68 AA A9
00 10 00 04 C0 AD 30 04 40 AA E8
A0 FE 04 85 4D A0 FF 04 85 4E CA
F0 18 18 A5 4D 69 13 85 4D A5 4E
69 00 85 4E 4C 81 03 A0 00 B1 4D
AA C8 A1 4D A8 0E 01 04 0C 02 84
98 60 A0 00 04 AE 01 04 AC 02 84
85 45 E6 46 48 A0 48 98 48 04 59
A0 FE 04 85 4D A0 FF 04 85 4E E6
48 C5 46 F0 10 18 A5 4D 69 13 85
4D A6 4E 60 09 05 4C 45 F5 00 A0
88 E9 91 4D C8 A5 59 91 4D C8 A8
98 00 09 08 C8 A5 59 91 4D 68 A8
68 AA 68 00 85 42 C8 B8 F0 08 20
A2 04 4C 27 04 A0 00 B1 4D 20 00
5A 03 18 00 F9 18 99 4B 03 43 A5
48 13 03 4C 2E 85 C9 20 B8 03 4C
54 85 B5 44 A9 00 85 45 A9 50 85
45 23 10 85 20 C8 44 4B A5 43 85
42 85 4A 85 4C A9 06 30 E5 43 85
48 85 4D 85 4F 68 C6 47 30 04 4A
4C 73 04 20 B7 84 C8 A5 43 F0 12
A5 47 85 47 20 C8 44 C8 47 30 04
0A 4C A0 04 20 C8 44 20 A2 04 20
D8 01 E8 E8 00 D0 00 68 A9 03 AA
A5 43 80 49 10 A5 41 69 20 85 41
A5 42 69 00 85 42 68 68 20 E3 84
10 03 48 01 41 80 29 3F 20 B3 85
10 03 48 01 41 80 34 48 85 49 8A
68 A1 45 AA 49 A4 00 00 A9 20 A5
41 E3 01 85 41 A5 42 E9 00 85 42
68 82 48 01 41 C8 48 38 04 49 4C
E8 01 C8 4D 30 04 0A 4C F3 04 29
3F 85 4E 68 85 4E 68 48 E6 49 E5
4C 01 41 00 4A 38 04 0A 4C 04 03
C8 4C 38 E5 4A 4C 12 65 A5 45 18
09 03 85 45 A5 46 69 00 85 45 C8
44 03 EF A2 80 04 B0 C9 3F 90 03 4C
4E 84 29 7F B5 44 A9 00 85 45 A8
5C 03 40 20 18 03 20 C8 04 95 41
28 A7 04 E8 E8 08 00 F3 4C A8 B4
A2 01 91 41 28 A7 04 CA D0 F3 4C
A8 04
CHECK= 14502

START=6000
A5 51 85 5C A5 58 85 5D A0 00 B1
5C C3 FF D0 01 60 85 60 C8 B1 5C
85 61 C8 B1 5C 85 62 C8 B2 F3 10
A0 03 A4 61 20 38 02 A0 02 A5 02
91 5C 18 A5 5C 69 00 85 5C A5 5D
69 00 85 5D 4C 00 60 C8 B1 5C 85
5E C3 B1 5C 85 5F C8 B1 5C A3 C8
C8 01 5E C8 FF F0 10 00 02 C3 01
5E 00 62 00 9E A0 85 91 5C A0 01
A5 03 65 01 91 5C 4C 21 60 A0 00
B1 5E 4C 54 60 85 62 48 00 43 98
48 A0 00 85 60 A0 00 85 61 33 A5
60 C0 00 05 00 A5 61 E8 01 03 01
C6 02 D0 EF A5 00 85 5C 85 50 A0
00 B1 00 C9 FF F0 4E C9 FE F0 36
20 C8 06 48 B1 00 85 5E 08 A1 5C
A4 50 20 3D 02 E8 E0 20 98 01 A2
00 C8 84 50 8E 5C 85 5E D8 E3 20
C8 86 4C 99 00 4B 18 A5 00 01 01
85 C0 A5 01 00 00 E5 01 68 00.20
C8 86 01 98 85 5C 20 C8 86 01 00
85 50 20 C8 86 4C 19 00 68 A9 00
A9 08 08 38 A5 49 0E 20 00 79
08 B0 00 03 A0 84 E8 D0 F0 A0 00
03 28 29 38 00 85 48 40 00 48 98
40 A9 00 85 41 A9 A8 85 42 C8 88
F0 10 10 A5 41 69 40 85 41 A5 42
69 0. 85 42 4C 10 C7 60 A0 A5 48
C9 20 90 4E A0 00 85 43 A9 99 85
44 38 A5 48 E5 1F E5 40 C6 48 F0
10 18 A5 43 69 00 85 43 A5 44 69
00 A4 44 4C 43 A7 A2 00 84 45 8A
A8 B. 43 94 45 18 69 40 01 4. 28
70 07 E8 38 08 D8 E0 A8 00 AA
08 08 18 A5 41 69 28 85 41 A5 42
69 00 85 42 00 A2 00 91 41 40 28
70 07 08 5A D6 F0 4C 72 67 00 00
A8 01 99 83 84 B8 30 FA A9 85 8D
89 84 A9 38 8C 8A 84 4C 00 01 C8
C0 00 D8 32 A6 01 0C 8A 84 A9 01
8D 14 84 A9 06 8D 11 84 8D 12 84
8D 13 84 A9 00 8D 18 84 A5 21 D5
81 A9 00 85 06 85 02 A9 37 81 03
AE 8A 84 E6 01 E5 03 CA D0 F1 A0
00 8. 00 99 0E 1F 01 82 98 E3 10
C8 D0 F3 E6 EF EA EA EA EA 01 EA
EA A0 00 99 44 99 00 20 99 03 21
99 00 22 99 00 23 C8 D0 F1 A1 00
8D 00 04 8D 0E 04 8D 10 04 01 0F
04 A9 02 8D 1C 04 20 03 78 A3 14
8D 08 8F 00 98 8F A0 A8 8F A3 07
8D 09 8F 8D 91 8F 8D 89 8F A2 00
8D 07 69 C9 FF F0 10 85 88 E3 8D
07 85 05 A1 A0 00 E8 8D 07 8D C8
A3 E6 D8 E0 91 00 C8 D0 F2 29 E3
69 20 F6 80 AC 00 84 10 03 31 60
C8 8F A0 A0 04 C8 84 90 18 C1 14
90 00 48 A9 32 80 1A 8F 06 30 E9
14 41 8C 08 4E A9 31 8D DA 8F 69
38 E3 A0 18 85 30 A0 00 DB 8F A9
A2 A0 03 13 04 18 69 30 80 85 8F
```



SHARDS

THE FAMILY FAVOURITES

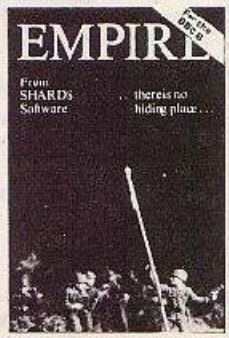
ELECTRON, BBC
DRAGON/TANDY COCO
CBM 64/AMSTRAD (March)
£7.95

FOUR PART EDUCATIONAL ADVENTURE

"Shardsare now setting a standard for this type of adventure."
Micro Adventurer.
"An excellent educational program with something of interest to kids of all ages - including big ones".
Electron User.

SPECTRUM 48K,
CBM 64
£9.95
EPIC
FOUR PART
FAMILY
ADVENTURE.

"I liked this mixture of puzzles, games and text adventure and felt it represented good value for money. HCW.
"An entertaining release ... a nice package to play together after Christmas lunch". PCW.



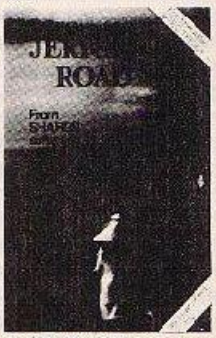
CBM 64,
ELECTRON, BBC
DRAGON/TANDY COCO
£6.95
COLOURFUL GAME OF WORLDWIDE STRATEGY.

"I thoroughly enjoyed this game... the graphics are excellent".
(Electron) HCW
"Not a bad attempt at simple war-gaming ... a good game".
(CBM 64) HCW

SPECTRUM 48K
£5.75

EXTENSIVE ILLUSTRATED TEXT ADVENTURE.

"An intriguing adventure, original in many ways ... should appeal to most adventurers."
PCN.



SPECTRUM 48K
BBC/ELECTRON (March)
£5.75
FULL FEATURED EDUCATIONAL ADVENTURE.

"A gentle, original and enjoyable adventure".
Sinclair User.
"The program is enjoyable and interesting because of its historical accuracy".
PCN.

AVAILABLE NOW FROM SELECTED BRANCHES OF BOOTS AND ALL GOOD STOCKISTS
or by mail order, using the coupon.

To: SHARDS SOFTWARE, 189 ETON ROAD, ILFORD, ESSEX IG1 2UQ (phone 01-514 4871)

Please send me a copy of (please tick) Pettigrew Chronicles ☐
Empire ☐ Galilee ☐ Jericho Road ☐ Mystery of the Java Star ☐
My computer is .....
Name .....
Address .....
.....
Please debit my ACCESS/VISA Account, A/C No. .....
(or phone 01-514 4871 to save time) I enclose a cheque/PO remittance for £ ..... made payable to SHARDS SOFTWARE.
Signed .....

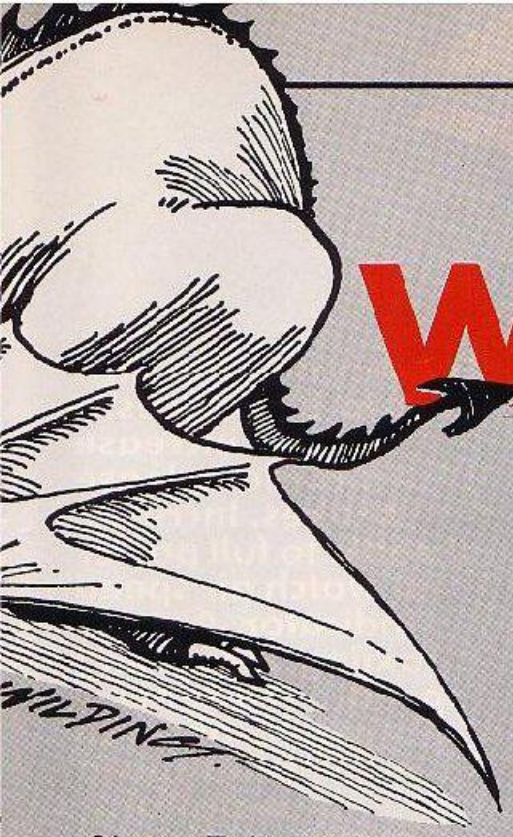
Program 2.

```
2710  7F2D497F2D4A108E  2B9
2718  060010BF2D4310BF  214
2720  2D4710BE1E0010BF  1FF
2728  2D451702CC8E0462  24B
2730  9F888E2D62BD90E5  476
2738  17021F27FB9E8830  2B0
2740  02A7B4B159270781  2B6
2748  4E26ED1702B8861E  2D6
2750  B72D42BE04001702  1D1
2758  BA1704FF1701C517  2C8
2760  02C31701F527F581  36F
2768  03102703718109 26  15E
2770  138C05FF27E6E780  417
2778  10BE2D43312110BF  25F
2780  2D4320D58108261 5  229
2788  8C040027CFE78430  321
2790  1F10BE2D43313F10  1DD
2798  BF2D4320BC815E26  310
27A0  398C04202512E784  28B
27A8  3088E010BE2D4331  307
27B0  A8E010BF2D4320A1  388
27B8  10BE2D47108C0600  1E4
27C0  279A31A8E010BF2D  376
27C8  4710BE2D4331A8E0  33E
27D0  10BF2D4317023C16  1AA
27D8  FF7F810A263C8C05  2FC
27E0  DF2213C704308020  357
27E8  10BE2D4331A82010  247
27F0  BF2D4316FF6310BE  375
27F8  2D47108C1BFF1024  25E
2800  FF5A31A82010BF2D  34E
2808  4710BE2D4331A820  27E
2810  10BF2D431701FC16  269
2818  FF3F810C26061700  20E
2820  EF16FF35815D2605  342
2828  BD3516FF2C811526  2BF
2830  058D4216FF23815F  2EC
2838  260617022E16FF19  1A1
2840  815B260917024C17  187
2848  01C916FF0C811326  2A5
2850  08341417046B1603  EF
2858  9DBD4C16FEFB3910  3CE
2860  BE2D45A6A2A72110  350
2868  BC2D4326F68660A7  3D5
2870  A417019F3910BE2D  28F
2878  43A621A7A010BC2D  34A
2880  4526F68660B71DFF  41A
2888  17018839E7B410BE  312
2890  2D43108C1DDF220E  238
2898  300131211F10C41F  195
28A0  26F610BF2D433934  2C8
28A8  06810D26048DDD20  248
28B0  318120254B4D2B0C  1C6
28B8  814025068160250 4  1F6
28C0  84DF8840A78010BE  420
28C8  2D43108C1DFF250C  259
28D0  2704301F200CA7A4  1F1
28D8  301F2006A7A010BF  23B
28E0  2D438C05FF232710  25A
28E8  BE2D47108C1BFF24  30C
28F0  0731A82010BF2D47  243
28F8  1701188E05E0200E  1D1
2900  8660A78010BE2D43  34B
2908  A7A010BF2D433586  341
2910  341010BE2D430660  268
2918  A780A7A01F10C41F  380
2920  26F4359034108D02  2B2
2928  35907A2D42260B86  265
2930  3CB72D42A6848840  354
2938  A7848E0320301F26  251
2940  FC39F6FF00CA807D  4F1
2948  FF022B02CA4039C6  337
2950  7FF7FF02F6FF00C4  530
2958  40393414BD034D35  1D3
2960  94327E8E01517FFF  3A2
2968  02F6FF00CA80E184  4A6
2970  27721F9873FF028D  351
2978  C9C1FF2667A7806F  4AC
2980  E4C6FEF7FF028DBA  5E7
2988  E761E884E484A661  523
2990  A7805D260A6CE443  347
2998  79FF0225E920459E  38E
29A0  978D9A1E898D9BE1  46E
29A8  611EB92637A6E480  36F
29B0  08BB085424FB4D27  282
29B8  32B10C2517811125  1B2
29C0  28B12A22228B308D  25F
29C8  8627127D0149260D  1B9
29D0  8A2020098B3017FF  2A4
29D8  7626028010811226  1E7
29E0  047301494F359080  255
29E8  1A800B4817FF6026  289
29F0  014C8E2D26A68620  27A
29F8  F4C6608E0400E780  403
2A00  8C05FF23F9398E06  379
2A08  008660A7808C1E01  2B8
2A10  26F93910BE2D47CE  368
2A18  0400A6A0A7C01183  345
2A20  060026F63934167D  222
2A28  2D49261FB6FF008A  2FA
2A30  C081FF26057F2D4A  361
2A38  202F7C2D4AB62D4A  26F
2A40  816425286FFB72D  398
2A48  49201E7FFF02B6FF  3BC
2A50  008AC081FF26057F  374
2A58  2D49200D8E015186  209
2A60  FF5FA7855CC10823  3D2
2A68  F9359634108D5E10  303
2A70  8C1DDF2218A6A820  330
2A78  A7A0108C1DDF23F5  3F7
2A80  CE1DE08660A7C011  429
2A88  031C0026F8351017  21B
2A90  FF813934108D3631  2F1
2A98  A82010BF2D4B108C  2AB
2AA0  1DFF2213108E1DFF  30B
2AA8  A6A8E0A7A410BC2D  472
2AB0  4B2304313F20F1FE  2F1
2AB8  2D4310BE2D4B31A8  28F
2AC0  E010BF2D4317FE48  37C
2AC8  FF2D43359010BE2D  32F
2AD0  431F20C41F270631  1C3
2AD8  3F301F20F4393414  223
2AE0  17FF16CE04009F83  2E5
2AE8  8E2D75BD90E53514  3AB
2AF0  BD295A27FB813110  324
2AF8  27010381322 73E81  1C4
2B00  3327178134270D81  1DB
2B08  35102700FE813626  247
2B10  DF1600E417FEFC16  400
2B18  FBF63414860DBD80  409
2B20  0C863EBD800C9E88  33F
2B28  BF2D4B170136C101  247
2B30  102700C217018A17  1B2
2B38  FED91600B9B6FF22  47D
2B40  8501102600B210BE  23C
2B48  2D4310BF2D4B3414  1FF
2B50  17FEA68E2EE6BD90  4AA
2B58  E517FDFE27FB8159  4F3
2B60  2608B62D62BD800F  2BF
2B68  200A814E26EBB62D  2ED
2B70  61BD800F17FE828E  3D2
2B78  2E83BD90E58D3B10  3BB
2B80  8E060010BF2D47A6  27D
2B88  A08160260486 2020  271
2B90  0E8161250480 4020  1F9
2B98  06811F22028B60BD  272
2BA0  800F10BC2D4B2437  22E
2BA8  8D0917FDADB10327  302
2BB0  2E20D41F20C41F27  26B
2BB8  0139860DBD800FFE  317
2BC0  2D4711B31BFF2416  25C
```

FEATURES OF Wordprof include

- Full auto repeat on keys.
- 2K, 100 percent machine code.
- Stores four separate files each 6144 characters in length.
- Files can be swapped.
- Automatic scrolling through text.
- Complete on screen editing.
- Search through a file for a string.
- Dump to printer with double width or normal.
- Files can be saved to tape from Basic.

DRAGON WORDPROF



Simon Tully and a machine-code word-processing program for the Dragon.

Text is typed in the normal way with auto key repeat if a key is depressed for two seconds. You control the cursor with the arrow keys. To insert a single character from the cursor use Shift and right arrow key together.

To delete use Shift and left arrow key. To insert whole lines use Shift and down arrow key. To delete whole lines use Shift and up arrow. Shift and 0 put you into lower case — green on black — as normal. The clear key deletes from the cursor to the end of the line.

Each file is 12 screens in length — 6144 characters.

Pressing the break key gives you a menu with single key commands. Pressing key 1 exits the program and enables you to save files to tape as per addresses displayed.

Pressing key 2 dumps current file to printer up to the cursor position. Make sure the cursor is placed at the end of text required.

Pressing key 3 is a search facility which requires you to enter a target string of up to 19 characters in length.

The search is performed from the cursor position plus one to the end of the file. If the target string is not found the cursor returns to the beginning of text else the cursor is placed on the target string. Pressing Shift and @ continues search for any reoccurrence of the target string.

Pressing key 4 clears the current file. Accidental presses of this key can be corrected by pressing Y to the question "old text? (Y or N)".

Pressing key 5 gives you the option to swap the current file with any of the other three.

Pressing key 6 just returns from menu to the current position in text. ■

Program 1.

```
10 CLS
20 CLEAR200,9999
30 INPUT"START ADDRESS";ST$:PRINT
40 ST=VAL("&H"+ST$)
50 PRINTHEX$(ST);"  ";
60 LINEINPUTA$
70 CO=0
80 FORI=1TOLEN(A$)STEP2
90 P$=MID$(A$,I,2)
100 POKEINT(I/2)+ST,VAL("&H"+P$)
110 CO=CO+VAL("&H"+P$)
120 NEXTI
130 LINEINPUTCH$
140 IFCH$<>HEX$(CO) THENPRINT"error
- retype";:GOTO30
150 ST=ST+8
160 GOTO50
```

```
2BC8  33C820FF2D47FE2D  3B9
2BD0  4333CB20FF2D4334  301
2BD8  2017FE373520398D  287
2BE0  D935148E0400108E  252
2BE8  060010DF2D4710DF  210
2BF0  2D4320048DC43514  22E
2BF8  17FE1816FB5B8E2D  354
2C00  E9A6802705BD800C  384
2C08  20F73917FDEB8E04  3E1
2C10  009F888E2E97BD90  3C7
2C18  E517FD3E27FB8132  40C
2C20  26058E32C8201081  264
2C28  3326058E4AC92007  226
2C30  813426E58E62CA10  38A
2C38  8E0600A684E6A4E7  42F
2C40  80A7A0108C1E0026  2A7
2C48  F28E0400108E0600  228
2C50  10BF2D4310BF2D47  282
2C58  16FF9DE684C840E7  50B
2C60  84C840398E2D4DC6  393
2C68  01BDB505810B2607  22E
2C70  5A27F1301F204581  2A7
2C78  15260A5A27E68608  23A
2C80  BDB54A20F6810D26  386
2C88  044F6F8439812025  245
2C90  D822098660A780B6  396
2C98  205C2020817B24C9  2A5
2CA0  B72D4B4D2B0C8140  274
2CA8  2506816025048 4DF  298
2CB0  8840C11424B3A780  39B
2CB8  5CB62D4EBDB54A20  366
2CC0  A810BE2D433121B6  2EE
2CC8  2D4DA1A02708108C  286
2CD0  1E0025F6203E8E2D  252
2CD8  4E10BF2D4BA68027  2E2
2CE0  08A1A426E2312120  2C7
2CE8  F410BE2D4B313F10  2BA
2CF0  BF2D4317FDD710BC  3B6
2CF8  1C1F230531A8E020  23C
2D00  F510BF2D47FC2D43  3A4
2D08  B32D471F01308904  204
2D10  00AF63398E0400AF  28C
2D18  63108E060010BF2D  203
2D20  4310BF2D47393012  201
2D28  2C3C2D3D2E3E2F3F  1AC
2D30  40135E5F0A5B0815  192
2D38  095D20200D0D0C5C  128
2D40  0303360605 1E0006  6B
2D48  0000000620000000  26
2D50  0000000000000000  0
2D58  0000000000000000  0
2D60  000F0E4F4C442054  170
2D68  4558543F20285920  1F1
2D70  4F52204E2900312E  197
2D78  2020204558495420  1BA
2D80  50524F4752414D20  238
2D88  0D322E2020205052  16F
2D90  494E54204F555420  223
2D98  2020200D332E2020  10E
2DA0  2046494E44204120  1C2
2DA8  535452494E470D34  218
2DB0  2E202020434C4541  1A3
2DB8  52204D454D4F5259  24B
2DC0  200D352E20202053  143
2DC8  57415020424C4F43  228
2DD0  4B5320200D362E20  16F
2DD8  202052455455524E  220
2DE0  2020202020202000D  ED
2DE8  000D544F20534156  1BA
2DF0  4520544558542046  210
2DF8  494C453A0D424C4F  1FE
2E00  434E0D3153542E53  1F4
2E08  544152543D313533  211
2E10  362020454E443D37  1C1
2E18  3638300D324E442E  19D
2E20  53544152543D3133  22F
2E28  3030302045 4E443D  1C4
2E30  31393134340D3352  195
2E38  442E53544152543D  23D
2E40  3139313435204 54E  1B7
2E48  443D323532383 90D  198
2E50  3454482E53544152  238
2E58  543D323532393020  1B3
2E60  454E443D33313433  1DF
2E68  340D43534156454D  200
2E70  224E414D45222C53  1E4
2E78  544152542C454E44  23E
2E80  2C300D007072696E  222
2E88  74696E6720696E20  2C9
2E90  70726F6365737300  2FF
2E98  5357415020315354  233
2EA0  20424C4F434B2057  202
2EA8  495448 3A0D4B4559  215
2EB0  2032202020202 324E  152
2EB8  4420424C4F434B0D  1DC
2EC0  4B4559203320202 0  19C
2EC8  203352442042 4C4F  1E6
2ED0  434E0D4B45592034  1D8
2ED8  2020202034544820  170
2EE0  424C4F434B0D0044  1BC
2EE8  4F20594F55205741  224
2EF0  4E5420444F55424C  238
2EF8  4520574944544 83F  224
2F00  0D2859204F52204E  1BD
2F08  2900FFFFFFFFFFFF  623
```

'Engines on...check... flaps to 10 degrees... check...increase throttle, release brakes. Increase throttle to full power ...watch air speed indicator. Aircraft taxiing, increasing speed...170 knots... rotate, observe vertical speed indicator... increase elevator angle.
Take off achieved!'

The excitement of a DACC 747 take off fires the adrenalin like no other computer simulation. The 3D pilot's view and full array of instrumentation challenges you to take the role of piloting a Jumbo Jet...and once in control and taxiing down the runway, there's no turning back.
Take off achieved. Full flying control at your fingertips and seven British Airports to fly to...the drama of landing is waiting to unfold as you sit in the hot seat of a 747 flight deck.

Over 45 dials and indicators to control with simulated emergencies, systems failures and audible alarms. Runways visible in true perspective on take off and landing. Optional use of joysticks.
100% Machine Code on Commodore 64k Sound and Spectrum 48k.
Also available for Dragon 32/64, Tandy CoCo (32k), BBC Model B, Acorn Electron, Atari 400/600/800 (48k).
Cassette Price £9.95 including VAT and postage. Spectrum Price £7.95. Commodore or Disk Price £11.95.

747 FLIGHT SIMULATOR FROM DACC

The leaders in Flight Simulation.

dacc ©LIMITED©

To: DACC Ltd. (Dept. YC4),
23 Waverley Road, Hindley,
Wigan, Lancashire WN2 3BN.

Name (BLOCK LETTERS) _____
Address _____
_____
County _____ Postcode _____
Please send me ..... copies of the DACC 747 Flight Simulator at .....
I enclose cheque/Postal Order for the total of .....
My computer is a .....

All dealer enquiries to sole distributor: MICRO AIDS, Beech House, Hob Hey Lane, Culcheth, Warrington. Tel: 092 576 2613/5930.

```
and calculator() be
$(
    let final.answer = 0
    writes ("Calculator *n")
    newline()
    final.answer := expression()
    writef (" %N", final.answer)
    delay(200)

$)
and expression() = valof
$(
    let answer,newno = 0,0
    let operator = '+'
    until operator = '=' do
    $(
        newno := readn()
        switchon operator into
        $(
            case '+': answer := answer + newno; endcase
            case '-': answer := answer - newno; endcase
            case '*': answer := answer * newno; endcase
            case '/': answer := answer / newno; endcase
        $)
        operator := rdch()

    $)
    resultis answer
$)
```

Figure 4. A four function calculation written in BCPL.

John Dawson takes a look at two languages for the BBC.

BBC ADE AND BCPL

THIS ARTICLE is not a comparative review in the usual sense. Both of the languages are good and complete implementations and my main purpose is to compare the uses to which you may put them, not to recommend a best buy. The ADE system is designed and marketed by System, 12 Collegiate Crescent, Sheffield and BCPL is an Acornsoft language.

ADE: An ordinary assembler produces one machine-code instruction in the object code — the machine code that will control the computer — for each line of source code — the instructions that you type into the computer. That is a low level language. Basic, or BCPL, or Forth are high level languages because each instruction that you type may make the computer carry out hundreds or thousands of machine code instructions. The Basic instruction X = SQR(Y), for example, would require at least a page of instructions if it was written down in machine code or assembler.

A macro assembler lies somewhere between the ordinary low level assembly language and the familiar high level languages. A "macro" is a set of low level instructions that you have written for your own purposes which you can insert into the object code program simply by typing the name of the macro into the source code.

Once the macro is written it can be put into a library and taken out and used whenever you wish. In other words you can build a set of high level instructions to your own design and fit them into place in your programs just like Basic commands.

ADE is supplied with a disc containing utility and demonstration programs. The demonstration is impressive and the SYSLIB file has a number of useful macro definitions. For example, figure 1 lists macros that will send an FX or an asterisk command to the machine operating system, and handle an error in your program.

Each of the macro definitions is well documented and you should be able to see how easy it is to create your own high level instructions. Parameters are values that are passed from the main program into a macro or a subroutine. Parameter passing is very important since it determines the usefulness of *any* language, not just assembler.

The ADE macro assembler has good facilities to pass parameters into macros. The Error macro shows how a number may be used in the source code and, also, how the address of a string can be passed.

The E part of ADE is a sophisticated text editor for preparing and modifying the source code. Each package that appears has to have its own editor; BCPL has two, one large and one tiny, and Multi-Forth 83 has another. It is a complex job trying to learn three or four different sets of editing key functions and I try to use View for all my source code editing.

Each of the others has advantages — better printer control, more advanced search and replace facilities — better block moves and so on — but they take so long to look up in the manuals that you use more time than you save.

In ADE's defence I must say that the editor includes all the facilities you might need for word processing although the commands are at a comparatively low level. Nevertheless, it can be used for general-purpose text preparation, the ADE manual was written with the editor for example, and you could do much worse than to standardise on the ADE system. This is particularly true since ADE have rewritten the editor to work in an 80-column mode and with the second processor.

The third part of the ADE package is the SPY front panel monitor. "Front panel" refers to the days — about six years ago! — when microcomputers, and big PDP minicomputers as well, displayed the internal state

(continued on next page)

```
 10 REM DISC LABEL PRINTING PROGRAM
 20 WIDE = 14
 30CLS
 40LI = 8:REM NUMBER OF LINES ON LABEL
 50INPUT"HOW MANY TRACKS ON DISC" T$
 70REPEAT
 80  PRINT "TITLE     ";
 90  INPUT LINE T$
100  PRINT "TITLE 2 ";
110  INPUT LINE T2$
120  INPUT "HOW MANY COPIES " C
130  *FX6,0:REM LINE FEEDS ARE SENT TO
THE PRINTER
140  VDU2
160  REPEAT
170  VDU1,27,1,69:PRINT "BBC COMPUTER
     ";F$; "TRACKS"
180  PRINT:VDU1,WIDE:PRINT T$
190  PRINT:PRINT T2$
200  FOR L=0 TO LI-5:PRINT:NEXT L
210  C=C-1
220  UNTIL C=0
240  VDU3
250  UNTIL FALSE
260END
```

Figure 2. A quick Basic program for printing disc labels.

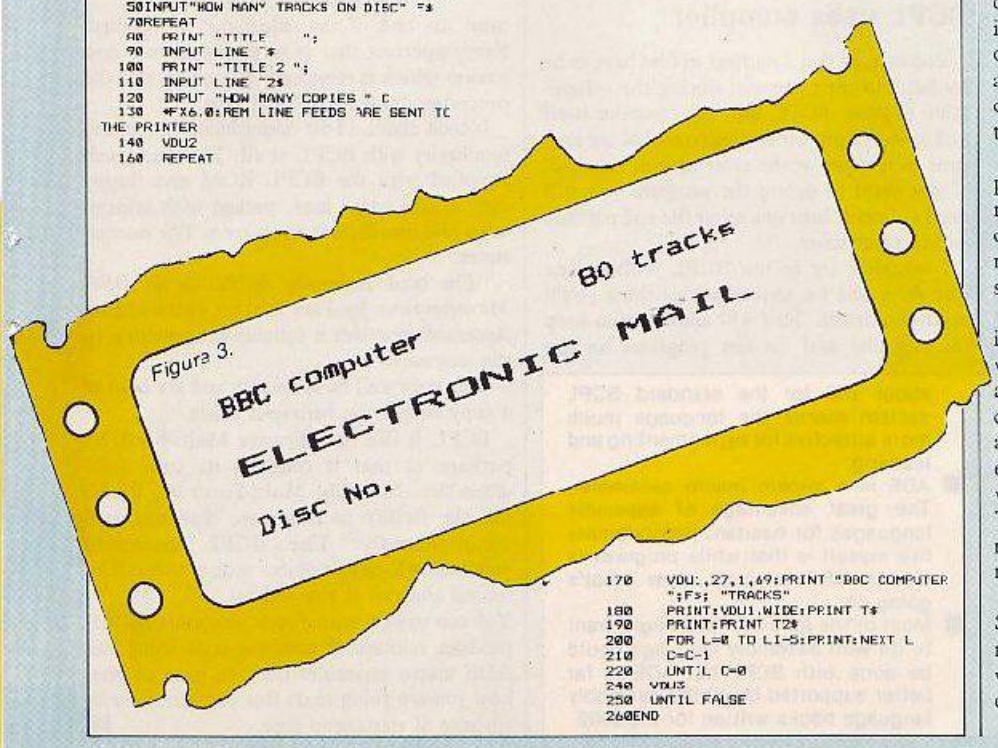


Figure 3.

(continued from previous page)
of the machine on serried ranks of lights on the front panel. Each light represented a binary bit in an internal register or buffer and the state of each bit could be altered by equally serried ranks of switches.

SPY can be entered from a running program or from the command state. The front panel monitor commands allow you to view a section of memory either from an address set by you or from the program counter. This means that the current section of a machine code program is listed in the memory block. You can jump automatically to the address following a JSR — Jump to subroutine instruction — and search for a specified byte pattern.

Further commands allow you to modify the contents of memory locations one at a time or in blocks, shift blocks of memory and compare the contents of two blocks. You can alter the 6502 registers, single-step your way through a program, continue running a program and start execution from a specified address. It's a good monitor.

Comprehensive instructions

ADE is completed by a comprehensive instruction manual which is properly printed, well laid out with a table of contents and an index, and plenty of examples.

The real difference between a good macro-assembler and the Basic interpreter supplied with the BBC Microcomputer is exemplified by the program listed in figure 2. I dislike untidy labels on my floppy discs and so I wanted to print a set of labels in a standard format. Figure 3 shows how the disc titles appear when they are printed on single-width continuous sticky labels.

It took about 15 minutes to write the program in figure 2, and a further 15 or 20 minutes to edit it until I achieved the layout that I wanted. Basic makes this type of job terribly easy. The program remains in the computer all the time and can be summoned up on to the screen for instant modification. Speed is wholly unimportant in this application. The number of lines to be printed can be altered very quickly until the program stays in synchronisation with the sticky labels.

All of these things are more difficult with an assembler. A macro assembler scores heavily where you are writing your own special-purpose interpreter, a print formatting program for example — there's one included in its source code form with ADE — high-speed data acquisition in a laboratory, text handling programs for which Basic is less well suited, and so on.

Figure 1. Macro definitions from the ADE SYSLIB library.

```
******FX******
;3 parameters
;A register value
;X register value
;Y register value
;note values can be expressions
;as well as constants
;examples
;   FX   4,1,0
;   FX   200 MASK,0
FX MACRO
LDA    £@1
LDX    £@2
LDY    £@3
JSR    &FFF4
ENDM
```

```
******ERROR******
;cause error using BRK
;two parameters
;@1 = error number
;@2 = error message
;example
;   ERROR   147,Value too big
ERROR MACRO
        BRK
        DFB   @1
        ASC   '@2'
        BRK
        ENDM
```

```
******STAR******
;issue simple star * command
;1 parameter, text of command
;examples
;      STAR   BASIC
;      STAR          ;catalog
;Note position of CONT, since
;ENDM cannot have a label.
STAR MACRO
        LDX   £>..L1
        LDY   £<..L1
        JSR   &FFF7
        JMP   ..CONT
..L1  STR   '@1'
..CONT
        ENDM
```

BCPL: This is a compiler language, unlike Basic, and was written by Martin Richards in 1967. It has been a stable language since about 1972 and the version offered for the BBC Micro is a full implementation of the BCPL standard Level 0 with some extensions and machine specific procedures.

A compiler works rather like an assembler; after typing in the source code for a program, the language reads the instructions, checks them for mistakes and compiles an object program which will be smaller than the original source and will run very quickly. The source code can be erased from the computer after storing it on disc.

The BBC version compiles the source code to an intermediate code — Cintcode — which is then interpreted by the BCPL Rom. This half-way approach is not the compromise that it seems and BBC BCPL does offer speed advantages over an already very fast Basic together with some portability between different machines.

If the program turns out to contain an error when the object program is executed, you must reload the source code, correct the error using a word processor or text editor, recompile the object code and try again. The language you are using may or may not give you an indication of where the program failed.

BCPL uses compiler

You can see that a number of files have to be loaded into the computer during the compilation process. BCPL uses the compiler itself and at least three other programs that are resident in memory at the same time or overlaid. If you want to debug the program you will need to load at least one other file and possible two or three more.

I wouldn't try to use BCPL without one disc drive and for serious work I think you'll need two drives. This will allow you to keep the compiler and the test programs on one drive, and source and object code on the other.

The user guide does explain how you can separate the development programs from the other utilities for testing the Cintcode but if you start to write a program of any size, and keep backup copies of the source and object code, your disc will fill up rapidly.

BCPL is a block-structured language like Pascal and Algol. The syntax of BCPL allows you to write well structured programs which do not use Goto instructions or labels. Indeed, the Goto instruction in BCPL will only work within a comparatively limited range.

Calculates a new answer

Unlike Basic, which separates data into numbers — integers and reals — and strings, BCPL makes no distinction and you can happily add the letter G to the number 173 to produce a nonsense result. This naivety on the part of the language is actually very helpful in many applications.

Figure 4 shows two declarations which act as a simple four function calculator on signed 16 bit integers. The function — a procedure which returns a value — "expression" declares three local variables and then loops round the block of commands following:

```
until operator = '-' do
```

until the end of the calculation is reached. Every operator that is read calculates a new answer which is eventually passed back to the procedure "calculator" and printed.

It took about 15 20 hours before I felt any familiarity with BCPL at all. The user guide supplied with the BCPL ROM and floppy disc, is 450 pages long, packed with information and insufficient on its own. The manual states:

"The book *Beginning BCPL on the BBC Microcomputer* by Paul Martin published by Acornsoft provides a suitable introduction to the language."

That may well be so but try and get hold of a copy before you believe it exists.

BCPL is like the Skywave Multi-Forth 83 package in that it contains its own 6502 assembler. Also, like Multi-Forth 83, BCPL has the facility to run more than one task simultaneously. The BCPL assembler produces relocatable object code which can be loaded and run at any address.

You can write a source code program that will produce relocatable machine code using the ADE macro assembler but you need to plan how you are going to do this very carefully in advance of starting to type. ■

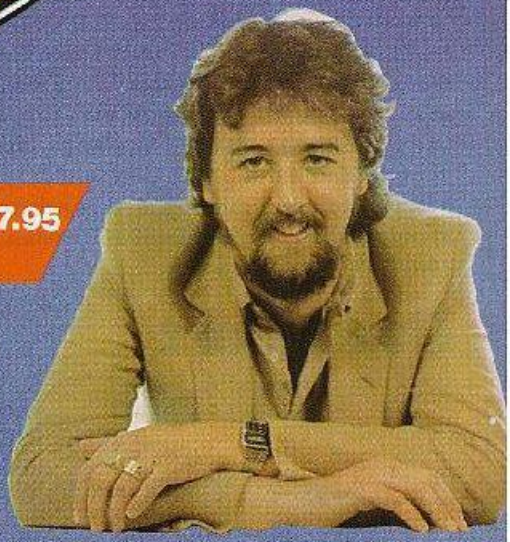
CONCLUSIONS

- Once you have become familiar with the BCPL language progress in programming will be quite fast. An additional floating point package is available containing trigonometric and logarithmic functions. While you require the BCPL Rom to run the intermediate code produced by the BCPL compiler, you can obtain a program which produces stand-alone machine code which will execute on either the BBC Micro or other 6502 based-machines.
- The recent price cut from £95 to about £50 for the standard BCPL system makes the language much more attractive for experimenting and learning.
- ADE is a superb macro assembler. The great advantage of assembly languages for hesitant programmers like myself is that while progress is slower, at least you know what's going on.
- Most of the jobs that you might want to do with assembly language could be done with BCPL but ADE is far better supported by all the assembly language books written for the 6502.

THE WAITING IS OVER!

The long awaited follow-up to FOOTBALL MANAGER by KEVIN TOMS is now available

Available NOW for SPECTRUM 48K £6.95 COMMODORE 64 £7.95 AMSTRAD CPC 464 £7.95

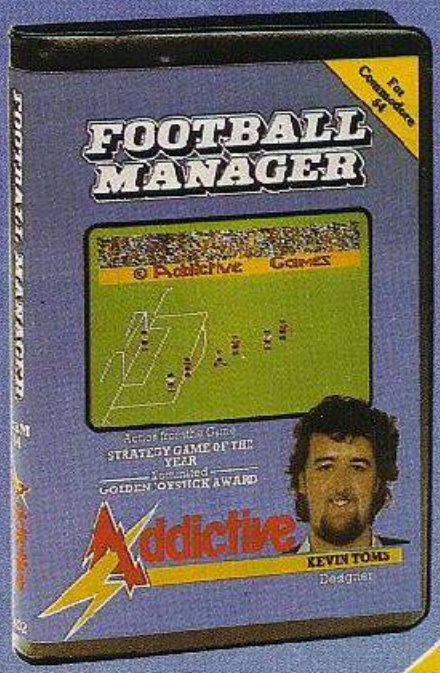


SOFTWARE STAR is the NEW game from Kevin Toms, who designed the Software Classic – FOOTBALL MANAGER. SOFTWARE STAR allows *you* to try your hand at running a successful software company. You have to cope with staff problems, game launches, advertising, financial problems and more while trying to produce chart topping successful games. One other thing, SOFTWARE STAR has that *gripping* Addictive quality that all Kevin's games have!

NOW AVAILABLE FOR YOUR COMPUTER!

FOOTBALL MANAGER

by KEVIN TOMS



"Absorbing and realistic – Highly recommended" – *Sunday Times, February 1984*

"Completely fantastic – I want one!" – *Charlie Nicholas, Arsenal striker in Big K, April 1984*

Some outstanding features of the game
- Transfer market
- Promotion and relegation
- F.A. Cup matches
- Injury problems
- Full league tables
- Four Divisions
- Pick your own team for each match
- As many seasons as you like
- Managerial rating
- 7 skill levels
- Save game facility
- Financial manipulations
- You can even be sacked!

NEED WE SAY MORE

Addictive

FOOTBALL MANAGER is available for the following computers:–

AMSTRAD CPC 464	£7.95
COMMODORE 64	£7.95
SPECTRUM 48K	£6.95
ELECTRON	£7.95
BBC MODEL B	£7.95
ORIC 48K & ATMOS	£7.95
DRAGON	£5.95
ZX81 16K	£5.95
VIC 20+16K	£5.95
(soon for MSX)	

Available from Boots WHSMITH and John Menzies (selected titles)

In case of difficulty buy by mail order.
Send Cheques/P.O.s to:–
ADDICTIVE GAMES
7a Richmond Hill, Bournemouth, Dorset BH2 6HE

A wealth of Peripherals for your Spectrum!

By RICK BRAVO

Since the 48K Spectrum was launched the opportunities it offered has attracted peripheral manufacturers throughout the world.

One of these manufacturers was bound to emerge as the "brand leader" and in the case of the Spectrum this turned out to be DK'tronics. The company is based in Saffron Walden in Essex and proudly boasts a history dating back to the ZX80. All the company's products are manufactured in England at their own factory and they have now established themselves as world leaders, exporting to over 30 countries.

Below you will find a review of their range which now includes over 16 products, all of which are available for the Spectrum and Spectrum + models.

Keyboard

The DK Microdrive Compatible Keyboard is the best selling keyboard in the world and is now used by around 10% of all U.K. Spectrum owners. It is microdrive compatible and offers more key functions than any other keyboard in its price range. The stepped keys and space bar make it even easier to use. It is constructed from high density black ABS and has 52 keys and a full width space bar. A separate numeric keypad of 12 red keys including single entry 'delete' plus single entry 'decimal point' facilitate fast numeric data entry.

From good computer shops everywhere at only £37.50 or direct from DK'tronics, add £1.50 post & packing.

Dual Port

The first port simulates 6,7,8,9, & 0 Keys. The second port simulates in (31) command.

The port will accept any Atari style joystick.

It will run any software. That is:-

(a) Using Keys 6,7,8,9 & 0.

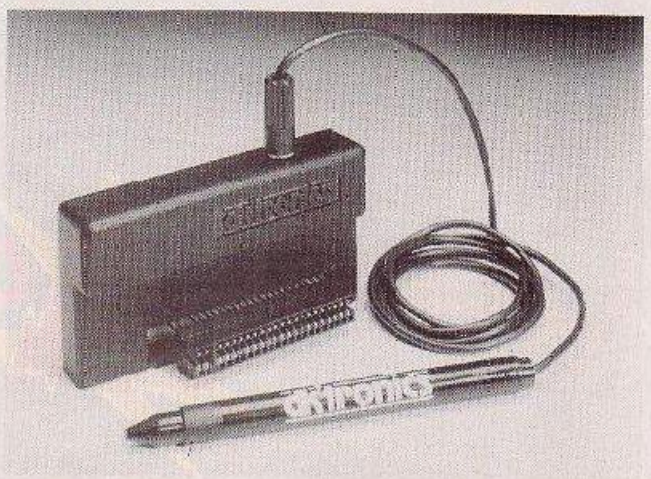
(b) Having redefinable key instructions.

(c) Using in (31) (i.e. Kempston).

This Dual Port interface interconnects with the existing range of DK'tronics products to form the most comprehensive range of Spectrum peripherals available from any manufacturer.

From good computer shops everywhere at only £13.00 or direct from DK'tronics, add £1.50 post & packing.

Light Pen



This highly successful Light Pen for the Sinclair Spectrum plugs neatly onto the rear of the Computer or the rear of the printer connector. The operating software now runs faster and supports 16 pre-defined instructions. You can change all the colours (Border, Paper, Ink), draw circles, arcs, boxes, lines and insert text onto the screen (ideal for diagrams etc.) Save & load completed or partly completed screens onto or from the tape.

There are also features to draw Free Hand and animate on the 48K Spectrum, you can retain and animate 5 screens.

You can also use the machine code on its own in your own programs for selecting out of a menu, playing games etc. All entry points necessary are given. The Pen works down to pixel level with pixel accuracy.

From good computer shops everywhere at only £19.95 or direct from DK'tronics, add £1.50 post & packing.

From **dk'tronics**®

Saffron Walden, Essex
CB11 3AQ tel:(0799)26350

3 Channel Sound Synthesizer

Any microcomputer is capable of manufacturing sound, however, in order to produce a single octave 'C' note with a frequency of 8372Hz the signal needs attention over 16,000 times per second.

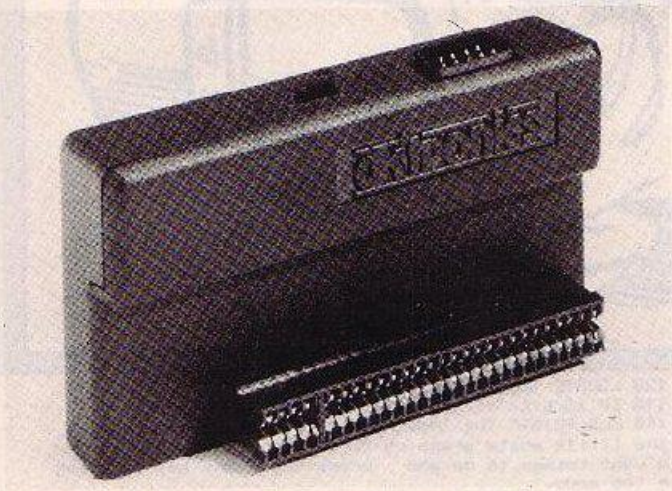
To produce software capable of perfoming just this one task would be difficult if not impossible, especially when you consider that to produce arcade type sound effects requires even greater attention.

The production of these sound effects without the constant attention of the processor is now possible thanks to the AY Sound Chip, its flexibility makes it essential for a wide range of applications including music synthesis and sound effects generation, continuing the monitoring and production of sound after the initial command.

More often than not realistic sounds require more than one effect and this function is provided by 3 independently controlled channels, as an example compare the sound produced by the single note of 'C' with that produced by the chord 'C' and you will know just what I mean, likewise producing the sound of an explosion using all 3 channels gives games a totally new dimension.

Add to this the ability to alter the pitch tone and shape of the sound you have produced and it's flexibility is unlimited. In simple terms, imagine the note you have produced as a calm sea, by altering the pitch and shape you can produce waves, the top of the wave corresponds with the maximum volume and pitch of the note, which like the wave itself rises and falls.

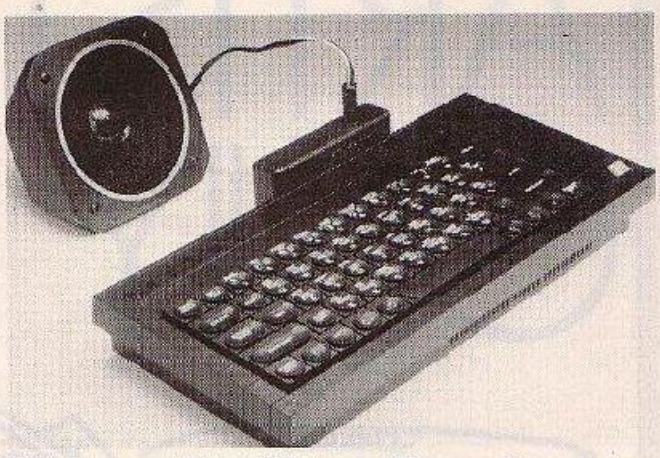
Programmable



At last! A fully programmable joystick interface with feed through connector that really works!

Now you can run ANY software from ANY supplier with the DK'tronics fully programmable joystick interface. It comes complete with machine code software and can be programmed in seconds to give full 8 directional joystick movements plus five capabilities and will accept any Atari/Quickshot type joystick. A catalogue is now available showing the full range of products available from DK'tronics the world's leading Spectrum peripheral manufacturer. The through connector enables other add-ons to be plugged into the rear.

From good computer shops everywhere at only £22.95 or direct from DK'tronics, add £1.50 post & packing.



Speech Synthesizer

The speech synthesizer uses the popular SL0/256 speech chip and has an almost infinite vocabulary. It is supplied with a text to speech converter for ease of speech output creation. Everything you wish to be spoken is entered in normal English, without special control codes or characters, it is therefore extremely easy to use. The voicing of the words is completely user transparent and the computer can carry on its normal running of a program while the speech chip is talking.

Although there are only 26 letters in the alphabet, letters have a totally different sound when used in different words. For example, the "a" in Hay is much longer and softer than in Hat. When you speak you automatically make adjustments because you know just how a word should sound. Not quite so easy with a computer. After looking at other speech synthesizers we decided that it was essential that the DK'tronics Spectrum Speech would offer a simple system that would enable the user to produce realistic speech that was instantly recognisable.

The solution to the problem was extremely complicated, it required hours of programming to enable the computer to look at the individual letters that make up each word and compare their relative position to each other before deciding on the appropriate sound.

I consider this to be the best Spectrum Speech Synthesizer on the market. From good computer shops everywhere at only £24.95 or direct from DK'tronics, add £1.50 post & packing

Centronics

The new Dk'tronics Parallel Centronics Interface will link your Spectrum to any printer with a standard centronics input. As the choice is vast, you can select the printer exactly suited to your needs.

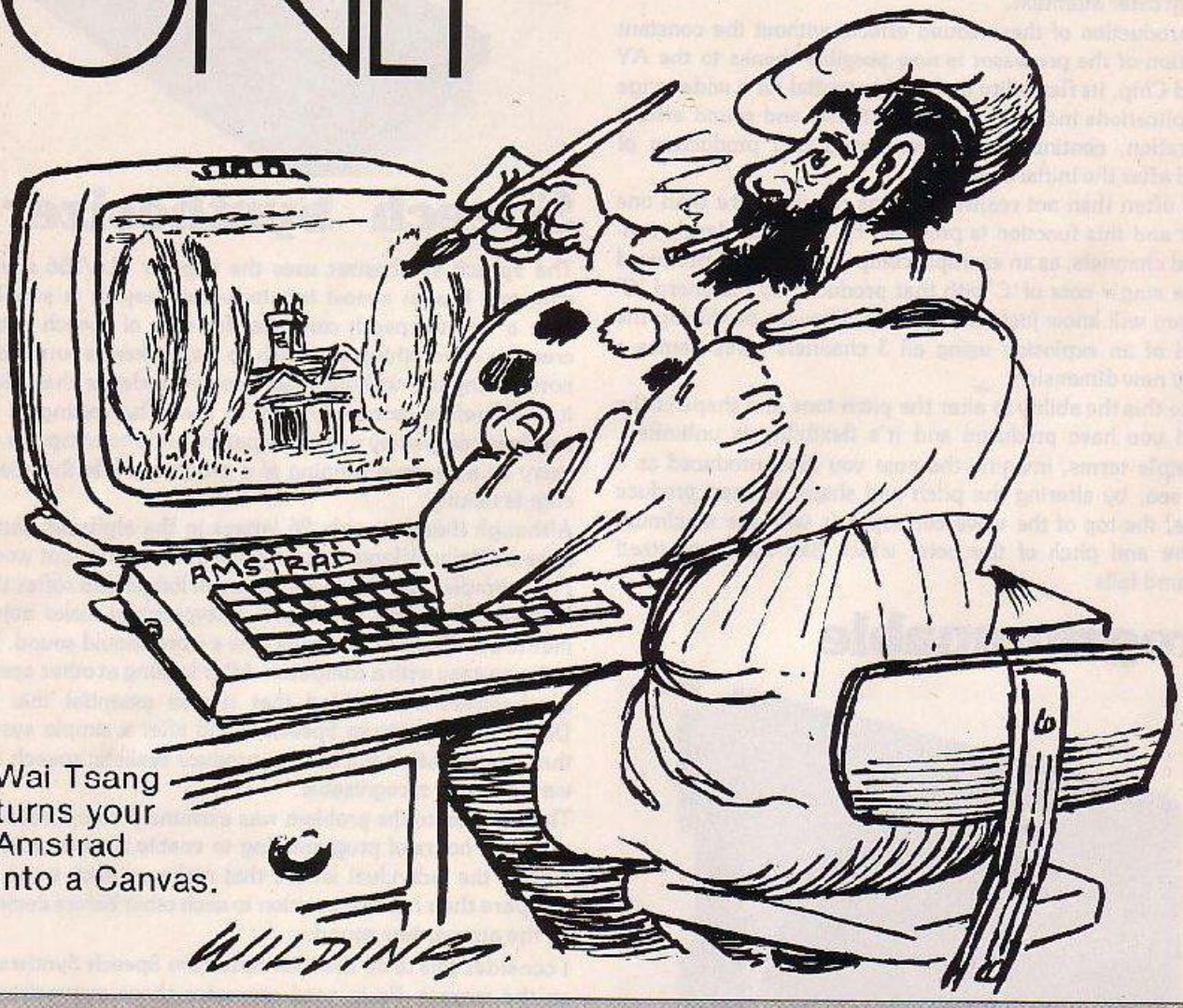
Features of the interface include: Runs all parrallel centronics type printers: Controlling software fully relocatable; Interfaces with any software using the printer channel e.g. Tasword Dev Pack etc; LList Lprint recognised. High res screen dumps; All control codes allowed through to printer; Fully microdrive compatible.

Supplied with full instructions and controlling software. From good computer shops everywhere and sensibly priced at only £39.95 or direct from DK'tronics, add £1.50 post & packing.

ARTISTS ONLY

ARTISTS ONLY is a drawing program for the Amstrad. If offers line drawing, circle plotting, and airbrush facilities, as well as routines for saving a drawing on tape or taking a screen dump on a printer. You can use the keyboard or a joystick. Full instructions are included in the program.

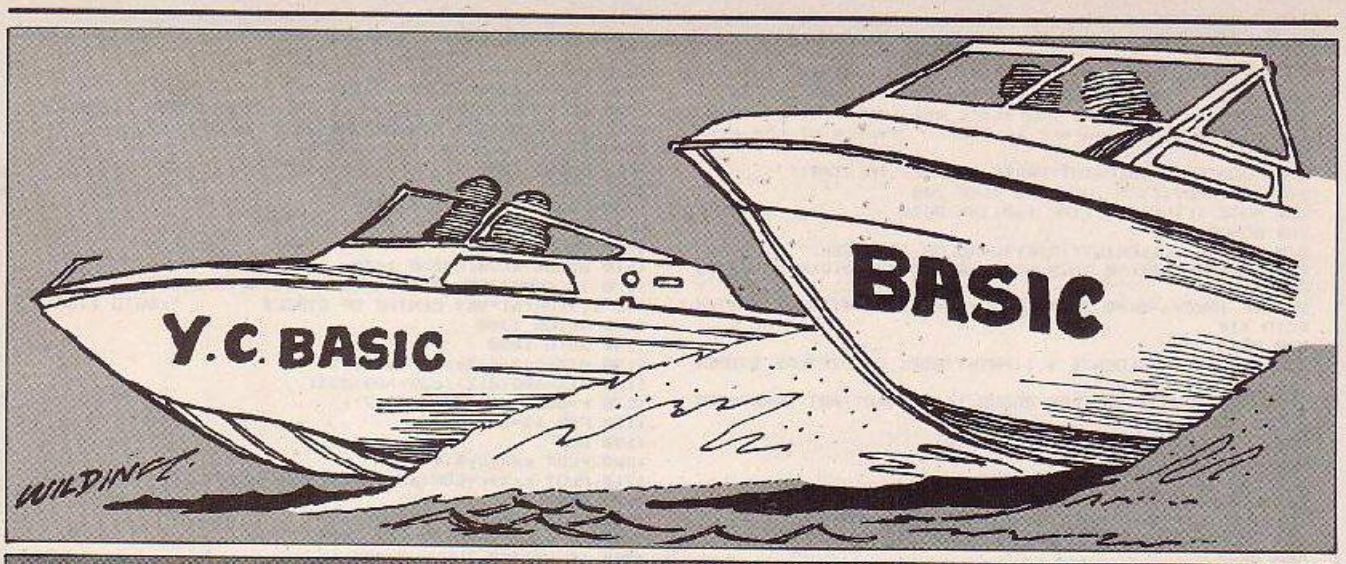
As it stands the program does not allow you to change the Ink and Paper colours. It is reasonably well structured, however, and you should have no trouble adding further options. These could also include a free-hand drawing facility and a fill routine.



Wai Tsang turns your Amstrad into a Canvas.

```
10 REM*************************************
20 REM*Program:ARTISTS ONLY
30 REM*A utility or something to do on a rainy day*
40 REM*By Wai Tsang and MEMPHIS SOFT*
50 REM*29/12/84 to 1/1/85,1 am*
60 REM*Written so that it might ge:          publishe
d in YOUR COMPUTER.*
70 REM*************************************
80 CLS:PRINT" This program turns your CPC 464 into a w
orking sketch pad with facilities such as an AIR BRUSH
,a LINE DRAWER,a routine which enables you to draw CIR
CLES easily,and last but not least a RUBBER."
90 PRINT:PRINT" You can also save you drawings on
 cassette to be finished later or to be  kept and used
 in your own programs."
100 PRINT" The final drawing can be dumped to a  prin
ter.To do this or to save you        drawing on cassell
e press (G) and then  follow the simple yes or no ques
tions."
110 PRINT:PRINT" If you are a sucker for your own work
s of art and you don't have a printer thenyou should l
oad the programs onto the   screen using PROGRAM 2 and
 then admire  your master piece fresh from the tape
you saved it on earlier"
120 LOCATE 10,24:PRINT"PRESS A KEY"
130 IF INKEY$<>"" THEN 140 ELSE 130
140 CLS:PRINT" The instructions are simple.Position
the little white graphics cursor to the place where yo
u want things to be and   press the right key to chang
e the mode."
150 PRINT:PRINT" The cursor is moved using the joystk
 but if you pick the all key board optionthen you use
 the numeric key pad where  UP=8,RIGHT=6,DOWN=2,LEFT=4
.
160 PRINT" To set the position of a point or to   turn
 something on and off press the FIREBUTTON on joystk o
r if you're using the key board then or the numeric pa
d        press '5'."
170 PRINT:PRINT" For the different modes its 'L' for
 LINE DRAWER,'C' for CIRCLE DRAWER,'A'   for AIR BRUS
H,'E' for ERASER and 'Q' to QUIT."
180 PRINT" The size of the AIR BRUSH's spray can  be c
hanged using the UP and DOWN ARROW  KEYS on the cursor
 cluster."
190 LOCATE 10,24:PRINT"PRESS A KEY"
200 IF INKEY$<>"" THEN 210 ELSE 200
210 CLS:PRINT" Lastly for the screen dump and the save
to cassette press (Q)UIT and you can    still return t
```

```
o your drawing after      saving it or you can take a
rest and    load it in later and then finish it."
220 PRINT" Incidently you start off in the LINE   DRAW
ING mode with the cursor in the     centre of the scre
en."
230 LOCATE 10,15:PRINT"PRESS ANY KEY TO START"
240 IF INKEY$<>"" THEN 250 ELSE 240
250 MODE 1:INK 0,27:INK 1,0:INK 2,26
260 GOSUB 1460
270 LOCATE 8,1:PRINT"(K)EYBOARD OR (J)OYSTK."
280 IF INKEY(37)=0 THEN U%=11:D%=14:J%=20:O%=4:F%=12:G
OTO 310
290 IF INKEY(45)=0 THEN U%=72:D%=73:J%=74:O%=75:F%=76:
GOTO 310
300 GOTO 280
310 GOSUB 1460:LOCATE 1,1:PRINT"WORK ON PICTURE STORED
 ON CASSETTE (Y/N)"
320 IF INKEY(43)=0 THEN GOSUB 1460:LOAD"!ART WORK":GOT
O 350
330 IF INKEY(46)=0 THEN GOTO 350
340 GOTO 320
350 ss%=10
360 x%=320:y%=200
370 GOSUB 1460:LOCATE 1,1:PRINT"LINE DRAWER"
380 LOCATE 15,1:PRINT"SET FIRST POINT "
390 D%=0
400 GOSUB 1430
410 GOSUB 1290
420 GOSUB 1390:GOSUB 1430
430 GOSUB 1240
440 GOSUB 1390
450 IF INKEY(F%)=0 THEN GOTO 470
460 GOTO 400
470 IF o%=1 THEN GOTO 540
480 a%=x%:b%=y%
490 o%=1
500 SOUND 1,300
510 LOCATE 15,1:PRINT"SET SECOND POINT"
520 FOR S=1 TO 120:NEXT
530 GOTO 400
540 MOVE a%,b%
550 DRAW x%,y%,1
560 o%=0
570 SOUND 1,200
580 LOCATE 15,1:PRINT"SET FIRST POINT "
590 FOR l=1 TO 100:NEXT
600 GOTO 400
610 '*****Pixel brush routine*****
620 GOSUB 1460
630 LOCATE 1,1:PRINT"AIR BRUSH "
640 LOCATE 11,1:PRINT"OFF"
650 LOCATE 23,1:PRINT"DIAMETER=":LOCATE 32,1:PRINT ss%
660 SP%=0
670 GOSUB 1430
680 IF INKEY(0)=0 THEN ss%=ss%+2:LOCATE 32,1:PRINT ss%
:IF ss%>48 THEN ss%=48
690 IF INKEY(2)=0 THEN ss%=ss%-2:LOCATE 32,1:PRINT ss%
:IF ss%<3 THEN ss%=3
700 GOSUB 1290
710 GOSUB 1240
720 IF INKEY(F%)=0 AND sp%=0 THEN sp%=1:SOUND 1,200:LO
CATE 11,1:PRINT"ON ":GOTO 730 ELSE IF INKEY(F%)=0 AND
sp%=1 THEN sp%=0:SOUND 1,200:LOCATE 11,1:PRINT"OFF":FO
R L=1 TO 150:NEXT:GOTO 730
730 GOSUB 1390
740 IF sp%=1 THEN 750 ELSE 670
750 FOR I%=1 TO 5
760 r%=INT((RND*ss%)-(ss%/2))
770 r2%=INT((RND*ss%)-(ss%/2))
780 PLOTR r%,r2%,1
790 NEXT
800 GOTO 670
810 '*****Rubber routine*****
820 GOSUB 1460
830 LOCATE 1,1:PRINT"ERASER":LOCATE 8,1:PRINT"OFF"
840 rb%=0
850 GOSUB 1430
860 GOSUB 1290
870 GOSUB 1240
880 GOSUB 1400:GOSUB 1430
890 IF INKEY(F%)=0 AND rb%=0 THEN rb%=1:SOUND 1,200:FO
R l=1 TO 150:NEXT:LOCATE 8,1:PRINT"ON ":GOTO 900 ELSE
IF INKEY(F%)=0 AND rb%=1 THEN rb%=0:SOUND 1,200:LOCATE
 8,1:PRINT"OFF":FOR L=1 TO 150:NEXT:GOTO 900
900 IF rb%=1 THEN GOTO 910 ELSE GOSUB 1390:GOTO 850
910 FOR v%=-2 TO 2
920 MOVE x%-3,y%+v%:DRAW x%+3,y%+v%,2
930 NEXT
940 FOR v%=-2 TO 2
950 MOVE x%-3,y%+v%:DRAW x%+3,y%+v%,0
960 NEXT
970 GOTO 850
980 '*****Circle drawing subroutine*****
990 GOSUB 1460
1000 LOCATE 1,1:PRINT"SET CENTRE OF CIRCLE"
1010 GOSUB 1240
1020 GOSUB 1430
1030 GOSUB 1290
1040 GOSUB 1390:GOSUB 1430
1050 IF INKEY(F%)=0 THEN cx%=x%:cy%=y%:SOUND 1,200:LOC
ATE 1,1:PRINT"SET CIRCUMFERENCE OF CIRCLE":FOR l=1 TO
200:NEXT:GOTO 1080
1060 GOSUB 1390
1070 GOTO 1010
1080 GOSUB 1430
1090 GOSUB 1290
1100 GOSUB 1240
1110 GOSUB 1390:GOSUB 1430
1120 IF INKEY(F%)=0 THEN ox%=x%:oy%=y%:SOUND 1,200:LOC
ATE 1,1:PRINT"SET CENTRE OF CIRCLE        ":GOTO 1150
1130 GOSUB 1390
1140 GOTO 1080
1150 d1%=cx%-ox%:d2%=cy%-oy%
1160 d1%=ABS(d1%):d2%=ABS(d2%)
1170 r=SQR((d1%^2)+(d2%^2))
1180 FOR a%=1 TO 360
1190 DEG
1200 PLOT cx%,cy%,1
1210 PLOT cx%+r*COS(a%),cy%+r*SIN(a%),1
1220 NEXT
1230 GOTO 980
1240 IF y%<1 THEN y%=1
1250 IF y%>400 THEN y%=400
1260 IF x%<1 THEN x%=1
1270 IF x%>640 THEN x%=640
1280 RETURN
1290 IF INKEY(U%)=0 THEN y%=y%+4
1300 IF INKEY(D%)=0 THEN y%=y%-4
1310 IF INKEY(J%)=0 THEN x%=x%-4
1320 IF INKEY(O%)=0 THEN x%=x%+4
1330 IF INKEY(69)=0 THEN 620
1340 IF INKEY(58)=0 THEN 810
1350 IF INKEY(36)=0 THEN 370
1360 IF INKEY(62)=0 THEN 980
1370 IF INKEY(67)=0 THEN GOSUB 1480
1380 RETURN
1390 '*****Graphic cursor routine*****
1400 IF TEST(x%,y%)=1 THEN p=1
1410 PLOT x%,y%,2
1420 RETURN
1430 IF p=1 THEN PLOT x%,y%,1 ELSE PLOT x%,y%,0
1440 p=0
1450 RETURN
1460 LOCATE 1,1:PRINT"
                    "
1470 RETURN
1480 REM *QUIT,SAVE OR PRINT OUT*
1490 GOSUB 1460
1500 LOCATE 1,1:PRINT"SCREEN DUMP (Y/N)"
1510 IF INKEY(43)=0 THEN GOSUB 1700:GOTO 1540
1520 IF INKEY(46)=0 THEN GOTO 1540
1530 GOTO 1510
1540 GOSUB 1460
1550 LOCATE 1,1:PRINT"CASSETTE SAVE (Y/N)"
1560 IF INKEY(43)=0 THEN GOSUB 1650:GOTO 1590
1570 IF INKEY(46)=0 THEN GOTO 1590
1580 GOTO 1560
1590 GOSUB 1460
1600 LOCATE 1,1:PRINT"(A)NOTHER,(Q)UIT, OR (C)ONTINUE"
1610 IF INKEY(69)=0 THEN CLS:GOTO 310
1620 IF INKEY(67)=0 THEN !BASIC
1630 IF INKEY(62)=0 THEN RETURN
1640 GOTO 1610
1650 REM** cassette save **
1660 SPEED WRITE 1
1670 GOSUB 1460
1680 SAVE "!ART WORK",B,&C000,&4000
1690 RETURN
1700 REM** Screer dump.  **
1710 GOSUB 1460
1720 DIM i%(320)
1730 pixln=413
1740 FOR k%=1 TO 28
1750 pixln=pixln-14
1760 FOR I%=1 TO 319
1770 GOSUB 1870
1780 i%(I%)=p1%+p2%+p3%+p4%+p5%+p6%+p7%
1790 NEXT
1800 PRINT#8,CHR$(27);CHR$(75);CHR$(2);CHR$(64);
1810 FOR j%=1 TO 320:PRINT#8,CHR$(i%(j%));:NEXT
1820 PRINT#8,CHR$(i%(320))
1830 NEXT
1840 PRINT#8,CHR$(13)
1850 ERASE i%
1860 RETURN
1870 p1%=TEST(I%*2,pixln)
1880 p2%=TEST(I%*2,pixln-2)*2
1890 p3%=TEST(I%*2,pixln-4)*4
1900 p4%=TEST(I%*2,pixln-6)*8
1910 p5%=TEST(I%*2,pixln-8)*16
1920 p6%=TEST(I%*2,pixln-10)*32
1930 p7%=TEST(I%*2,pixln-12)*64
1940 RETURN
```



GO-FASTER BASIC

Richard Taylor with an ingenious way of speeding up Sinclair Basic by overcoming the Spectrum's ponderous method of searching through lines.

SINCLAIR BASIC is rather slow to say the least. Moreover, in common with most other machines Spectrum programs become slower as they increase in length. This is a result of the way in which the computer finds a line when you make a reference to it. For instance if you have a program in memory and the computer comes across the statement Goto 9999 it looks at the very first line of the program and asks itself "is this line 9999?", the answer will be no so it will go onto the next line and ask the same question. It will carry on doing this until it eventually finds 9999.

Even though the Spectrum hunts through the lines at a lightening fast rate the length of the program ensures that this can slow a program down considerably, especially if the program makes frequent use of subroutines right at its end. One of the methods used to combat this slowing effect is to put important subroutines that need to run at maximum speed at the start of the program and less important routines, such as initialisation and data statements near the end.

Although helpful this method is by no means perfect. For instance, what if you've got a lot of program that needs to run at maximum speed, it can't all be at the start. Secondly, it tends to be unnatural to structure programs in this way, most people like to write programs in the same order as they are executed, i.e. initialisation routines etc. first. In most programs this slowing down effect isn't too important, but Basic games using animation of any sort are slow enough to start with without any additional speed reducing effects.

There is, however, a better way of solving the problem that prevents the computer from needing to go through the whole rigmarole of searching through the program for a particular line. Once a program is Run the addresses of program lines in memory don't change. It's only when you add to or edit a program etc. that any address changes occur. Say you have a Goto 5000 statement in your program. Every time this Goto is encountered line 5000's address has to be laboriously found. But, like the line numbers, its address is a constant.

It seems pointless to spend a great deal of time and effort for a result that you know will be the same as the last time it was calculated. If the line number reference in a Goto is exchanged for its equivalent address then no searching is necessary. Lo and Behold, this is exactly what my program for the 48K Spectrum does. In fact, Gosub and Next statement are speeded up in a similar way. There are not the only commands to divert the execution of a program: Continue, Run and Return do as well but these are a damn sight harder to speed up and, in the cases of Run and Continue, aren't much used anyway.

Figure 1.

MEMORY CONTENTS	236	49	48	48	14	0	0	100	0	0
WHAT MEMORY CONTENTS REPRESENT	GO TO	1	0	0	BINARY NUMBER TO FOLLOW	100 IN FLOATING POINT BINARY				

When writing the program I've attempted to abide by the following two aims:

- Faster Basic must work with all Basic programs even if they were typed in without Faster Basic being in memory at the time.
- Faster Basic should be totally user transparent, i.e. it should do its job without any special action from you, such as calling machine code.

The 1.25K of machine code is sandwiched between Ramtop and the user definable graphics area. Before running remember to save it, just to be on the safe side. All the Basic does is to poke the machine code into memory: a task that takes a couple of minutes. When it's successfully finished the machine code can be saved with:

```
SAVE "FAST CODE" CODE 64058,1310
```

You can reload at any time with:

```
CLEAR 64057: LOAD "" CODE
```

Initialising the program is a simple task, just type:

```
RANDMIZE USR 64082
```

You'll get a new startup message, informing you that the machine code is up and running. You'll get the same message if you use New, it replaces the usual Sinclair copyright message.

Obviously you don't want to have to use memory addresses directly in Goto and Gosub statements but stick with the good old system of using line numbers. The computer therefore has the burden of having to remember both the line number and its corresponding

address for each Goto and Gosub. Because of the way programs are stored in memory this isn't too difficult to organise. When you list a program you don't see the whole story; parts of the program — as its stored in memory — aren't shown, mainly because these parts are for internal use by the computer and look like gibberish to anything but a computer. One such example of concealed program is the six bytes of data that follow every number used in the program. The first of these six bytes always has the value 14; a number which signifies to the listing routine that it shouldn't attempt to display the contents of the following five bytes.

These bytes contain the binary form of the preceeding decimal number. When a program is run these binary forms save the computer a great deal of time by being able to use these binary forms directly without having to convert the decimal representation that you typed in originally. For instance the statement Goto 100 is represented in memory as in figure 1. There's a similar format for a Gosub statement.

Faster Basic replaces the binary representation of the line number with the address of the line. This is perfectly legal as the computer no longer requires the binary bit as it no longer uses the line number directly — it's there for your reference only. Occasionally in a program you find a Goto or Gosub with not just a line number but a whole expression, ie. Gosub 2000+a*300, so the value of a determines which line is jumpted to. In such an instance Faster Basic doesn't alter anything, and when encountered it is treated as normal. This isn't a great handicap as statements of this sort are pretty rare anyway.

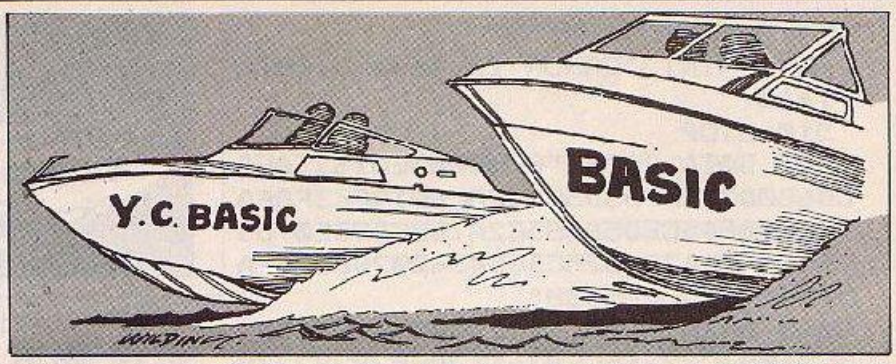
Speeding up a Next statement poses much more of a problem since there are no conveniently placed free bytes where the address of the line can be dumped and, secondly, it's not obvious where the Next must branch to, i.e. where's the For associated with that particular Next? The way to get around the first difficulty is simple — if there is no storage area then make one. A dummy binary representation area is inserted just after the name of the variable in the Next statement as shown in figure 2.

The second problem isn't quite as easy to solve. Clearly it's necessary to find the line number of the For connected with the Next in question. You could find it by locating the last For statement before the Next with the same variable. However, this could prove a slow process and not totally reliable. In any case, you've always got to make allowances for people who derive great pleasure from watching other people's programs crash, they might be evil enough to write something like:

```
10 GO TO 40
20 NEXT a
30 STOP
40 FOR a=0 to 100
50 GO TO 20
```

A far safer alternative is to not mark the line to which the Next is to jump to at all initially, just fill the five storage bytes with zeroes. The first time the Next is used in the program the computer will think to itself "look, that Next hasn't been marked with the address of the line it should jump to, I'd better find out what it is". The appropriate line, and therefore its address can be found by the usual method of searching through the program — in the same way as a Next would be treated normally. Before the jump to the line is made its address is carefully noted in the first two of the Next's five byte store, along with the statement number within that line. The following time the Next is used no searching is necessary — the address of the For line is already there.

One problem with this is that a program's length increases by six bytes for every Next in the program. This, along with the fact the Faster Basic machine code has already consumed over 1K above Ramtop, means that if a program was crammed into the Spectrum's memory to start with then, chances are, after Faster Basic has been at it, it won't fit at all — well, you can't win them all. If this is the case then you'll get an 'Out of Memory' report when you try to run the program. Be warned, once a program's been 'compiled' it'll never run again without Faster Basic in memory. The moral of the story? Always keep a copy of the pre-compiled version.



When using the Faster Basic you'll often find yourself with a blank screen while a program's being compiled, either if you Run it or try and use Goto — be patient the program hasn't crashed. A Basic program is recompiled every time it's re-entered after you've modified it in any way — and I include loading or merging in another program in that — even from Microdrive. Autorun is handled — loading an autorun program will result in a short delay while the program's compiled before it bursts into action.

Because of the mischievious way the shadow Rom in Interface 1 operates every time an Interface 1/Microdrive command is used Faster Basic is forced inactive. After such a command use Randomize USR 64061.

You'll get the start message printed up again but the program in memory is preserved. Unfortunately this method can only be used with Interface 1 statements used as direct commands, it's not possible to use these commands in an actual program at all.

It's difficult to give even a rough estimate of the speed increase gained by using Faster Basic. A program 30K or so in length can be considerably improved speed wise especially if it wasn't written with the most speed dependant parts at the start. The most important factor is, of course, the amount of times Nexts, Gotos, and Gosubs are used in the program; but I think you'll agree that they are well used commands.

Figure 2.

MEMORY CONTENTS	243	97	14	?	?	?	?	?
WHAT MEMORY CONTENTS REPRESENT	NEXT	a	FIVE STORAGE BYTES TO FOLLOW	FIVE BYTES TO STORE ADDRESS OF LINE				

```
 10 REM     'FASTER  BASIC'
 20 REM
 30 REM        48K Version
 40 REM    By Richard Taylor
 50 REM
 60 CLEAR 64057
 70 LET a=64058
 80 FOR l=0 TO 20
 90 LET t=0: READ v,a$
100 IF LEN a$/2<>INT (LEN a$/2)
THEN GO TO 500
110 FOR c=1 TO LEN a$ STEP 2
120 LET x=CODE a$(c)-48-7*(a$(c
)>="A")
130 LET y=CODE a$(c+1)-48-7*(a$
(c+1)>="A")
140 POKE a,16*x+y
150 LET t=t+16*x+y
160 LET a=a+1
170 NEXT c
180 IF v<>t THEN GO TO 500
190 NEXT l
200 PRINT "Data OK - Now SAVE"
210 STOP
```

(listing continued on next page)

(listing continued from previous page)

```
 500 PRINT "ERROR in line ";8000
+l*10
 510 STOP
8000 DATA 7936,"000000 3E01323AFA
CD6B0DAFED7B3D5CE1FDCB019EC3F8FA
F3ED4BB45CED5B385C2A7B5CD93E07D3
FE3E3FED472AB25C5D5436002BBC20FA
D9ED43B45CED5338"
8010 DATA 5419,"5C227B5CD9ED53B2
5C21003C22365CEB363E2BF92B2B223D
5C21B65C224F5C11AF15011500EBEDB0
EB2B22575C2322535C224B5C36802322
595C360D23368023"
8020 DATA 6193,"22615C22635C2265
5C3E38328D5C328F5C32485C21230522
095CFD35C6FD35CA21C61511105C010E
00EDB0FDCB01CECDDF0EFD363102FBCD
6B0DAF323AFA1104"
8030 DATA 5325,"FBCD0A0CFDCB02EE
18488027464153544552204241534943
27204F5045524154494E472053595354
454D2042792052696368617264205461
796C6F7220202041"
8040 DATA 7042,"75677573742C3139
3834A0FD363102CD9517CDB016AFCD01
16CD2C0FCD171BFDCB007E200C2A595C
CDA711FD3600FF18E42A595C225D5CCD
FB1978B1C237FCDF"
8050 DATA 7997,"FE0D28C7FDCB3046
C4AF0DCD6E0D3E19FD964F328C5CFDCB
01FEFD3600FFFD360A01CD93FC76FDCB
01AEFDCB304EC4CD0E3A3A5C3CF52100
00FD7537FD752622"
8060 DATA 6448,"0B5C21010022165C
CDB016FDCB37AECD6E0DFDCB02EEF147
FE0A3802C607CDEF153E20D778119113
CD0A0CAF113615CD0A0CED4B455CCD1B
1A3E3AD7FD4E0D06"
8070 DATA 6172,"00CD1B1ACD97103A
3A5C3C281DFE092804FE152003FD340D
0103001170 5C21445CFDCB0A7E280109
EDB8FD360AFFFDCB019EC34FFB3E1001
0000C3AFFBED4349"
8080 DATA 6794,"5C2A5D5CEB212FFC
F52A615C37ED52E56069CD6E19200BCD
B819CDE8193E01323AFAC1793DB0282D
C5030303032BED5B535CD5CD55163E01
323AFAE122535CC1"
8090 DATA 7443,"C5132A615C2B2BED
B82A495CEBC1702B712B732B72F1C345
FB21FEFF22455C2A615C2DCD5B595C1B
3A445CC357FDE7CDBF16FD340DDF0600
FE0D287AFE3A28EE"
8100 DATA 10477,"21F7FCE54FE779F
DCB0C7E200FFCECCA97FDFEEDCAA8FDF
EF3CAE9FDFEEA2855FEFACA81FDFED52
00AFEE6CA52FAFEEFC2441B4F3E01323
AFA79C3441BCD541F"
8110 DATA 7869,"D27B1DFDCB0A7E20
71FDCB097E208A3A3AFAA7C477FE2A42
5CCD6E193A445C282AA7C2EC1B477EE6
C078281FED7B3D5CFD3600FFC9C1FDCB
0C7E20073A3AFAA7"
8120 DATA 7281,"C477FE2A555C3EC0
A6C0AFFE01CE0056235EED53455C235E
2356EB192322555CEB225D5C571E00FD
360AFF15FD720DCAA8FC14CD8B192802
CF16DFFE0D28B7FE"
8130 DATA 9106,"3ACAA8FCC38A1CCD
821CDFFECBC28A1CC1EF0238EBCDE934
389CC3A8FCCDC2FD3047ED535D5C5E23
56234EC33AFFD1FD660D24E333ED4B45
5CC5E5ED733D5CD5"
8140 DATA 6333,"011400CD051F18D5
2A5D5C7E23FE0E2807CD1B2D30F5B7C9
EB210500197EFE0D2804FE3A20F0EB37
C9CD821CC3671E2A5D5C237EFE0E20FA
223BFA35CD6C1C01"
8150 DATA 6142,"06002A3BFA340922
5D5CFDCB374EC22E1C2A4D5CCB7FCAD8
1D2322685CEFE0E20FC00238CDDA1DD8
2A3BFA23E523237E235E23562A685C01
0F00094F7BBE201A"
8160 DATA 7458,"237ABE2B20142323
79BE28067EE1E5232377E15E23564FC3
3AFF5E2356D5237EEBF5CD6E19F1ED4B
535CB7ED42EBC1E173237223772371 23
704FC33AFF2A535C"
8170 DATA 7954,"2B11F300CDAEFE38
08CD03FF2A5D5C18F011EC0037F52A53
5C2BD5CDAEFE3809CDD0FED12A5D5C18
F1D113F13F30E6AF323AFAC97EFE3A28
15237EE6C037C023"
8180 DATA 7416,"23223BFA4E2346E5
09444DE11600C5CD8B19C1D018E3E7CD
C2FD3B06110002C38B19DFCD3B2D2A5D
5C23E5CD991E6960CD6E19ED4B535CB7
ED42EBE173237223"
8190 DATA 5313,"360123232322 5D5C
C9E7237EFE0D2808FE0E2820FE3A20F2
2B010600CD55162323E52A3BFA5E2356
010600EB09EB722B73E1360E06052336
0010FB23225D5CC9"
8200 DATA 3385,"2A535C19CD541F38
0C56235EED53425CFD710ACF14D13EC0
A6C079C345FD"
```

Psychedelia

A Light Synthesiser

New - the official Spectrum Upgrade!

Turn your Spectrum into a Spectrum + for just £20

- Professional full-size keyboard – includes 17 extra keys.
- Responsive typewriter-style action.
- Accepts all current Spectrum software and peripherals.
- Complete with 80-page User Guide and Companion Cassette.

Here's some exciting news for 48K Spectrum owners ... the official Spectrum Upgrade Kit.

The £20 Kit has everything you need to turn your Spectrum into the stylish new Spectrum +. You don't even need an understanding of electronics, just the ability to solder a few wires together! The leaflet in the kit gives clear, step by step instructions.

If you're not sure about doing it yourself, don't worry. Simply return your 48K Spectrum to Sinclair and for £30 we'll upgrade it for you.

Whichever you decide on, you'll also receive the new 80-page User Guide and Companion Cassette.

The bigger, better Spectrum keyboard

The Spectrum + measures 12½" x 6". It has a large typewriter-style keyboard, with hard, moulded keys.

You'll find the new keyboard has a smooth, positive action – ideal for touch-typing, word processing, simulation programs, and extended programming sessions. Two retractable legs give a perfect typing position.

There are 58 keys in all, including 17 new keys. Programmers will be pleased to see dedicated punctuation keys, a space bar, and separate shift keys for graphics and extended modes. And a reset button allows you to clear a program from your computer's memory without disconnecting the power supply.

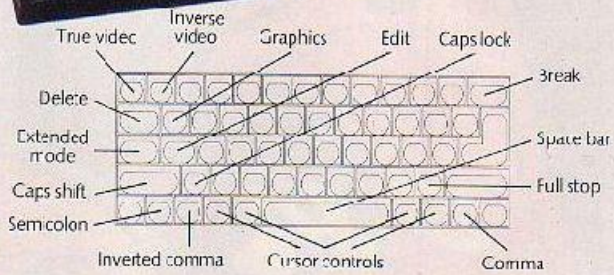
The official Spectrum Upgrade

Naturally your upgraded computer will accept all the peripherals in your Sinclair system - Interface 1, Microdrives and so on - as well as all Spectrum software.

Just as important, new Spectrum software and peripherals will be designed with the Spectrum + in mind. So the Sinclair upgrade adds stylish looks, new capabilities ... and new potential for the future.

Included – the new Spectrum + User Guide and Companion Cassette

The new User Guide has over 80 pages of information, including a handy BASIC dictionary. The Companion Cassette provides an interactive tour of the new keyboard, and includes three entertaining arcade games.



TO ORDER BY MAIL:

When ordering the Upgrade Service, send off your 48K Spectrum to the address below, carefully wrapped, together with the completed coupon and appropriate payment. (Please do not return the mains adaptor, manual or other ancillaries.) Your upgraded computer will be despatched to you within 10 days of receiving your order.

When ordering the Upgrade Kit, simply complete the coupon, enclosing the appropriate payment and post it to us at the address below. Please allow up to 28 days for delivery.

BY PHONE: Access or Barclaycard holders can call Camberley (0276) 685311 for personal attention, 9am to 5pm Monday to Friday. Only* the Upgrade Kits can be ordered by phone.

Please note: the upgrade offer applies to working 48K Spectrum models in the UK only.

To: Sinclair Research Limited, Upgrade Dept., Stanhope Road, Camberley, Surrey, GU15 3PS.

All prices include VAT, post and packing, User Guide and Companion Cassette.

☐ Please send me the Spectrum + Upgrade Kit. I enclose payment of £20.

OR

☐ Please upgrade my 48K Spectrum for me. I enclose my computer together with payment of £30.

I enclose a cheque/postal order payable to Sinclair Research Limited for £_____

OR

Please charge my Access/Barclaycard no.

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Signature_____

Name: Mr/Mrs/Ms_____ PLEASE PRINT

Address_____

YOC 503

Sinclair Research Limited,
Upgrade Department,
Stanhope Road, Camberley,
Surrey, GU15 3PS.

sinclair

TELSOFT

A reminder of how to use the Telsoft service.

THE PROGRAMS given here will enable Spectrum and BBC owners to download via *Your Computer's* Telsoft service. First type the hexloader for your machine — figure 1 — and then enter the machine code — figure 2. On the BBC you call the service by entering

CALL &6A00

while Spectrum owners must type

RANDOMIZE USR 60000

So far OE Ltd's Telemod 2 and VTX 5000 modems have been tested with the service, but it also works with a number of other makes.

To find out what is available on Telsoft and how to receive software dial up Colchester (0206) 8068. This audio recorded information line will also advise you which telephone numbers to ring for the 300 and 1200 bit/s services.

When a program you want to download is available, make sure your modem is set up and dial the number appropriate to your modem's speed. As soon as you hear the modem tones switch the modem to line and replace the receiver. Select Option 1 from the menu — Receive. After a block of data is received, you will see "OK" printed if there were no errors; otherwise the program will wait for the blocks to come round again.

When the "Program loaded OK" message appears return to the Telsoft menu and select Option 5. You can now save and run the program.

Figure 1. BBC.

```
10 REM BBC HEX CODE LOADER
15 HIMEM=&69FF
20 CLS:PRINT
30 INPUT " START ADDRESS (Hex)";A$
40 A=EVAL("&"+A$)
50 IF A>&6FB7 THEN 200
60 IF A<&2A00 OR A>&6FB7 THEN 20
70 PRINT "A";
80 INPUT ":" B$,C$
90 IF LEN(B$) <>16 THEN 50
100 T=0
110 FOR N=0 TO 7
120 X$= MID$(B$,2*N+1,1): GOSUB 300
130 IF E=1 THEN 260
140 X$= MID$(B$,2*N+2,1): GOSUB 300
150 IF E=1 THEN 260
160 B= EVAL("&"+MID$(B$,2*N+1,2))
170 T=B:A=A+1:T=T+B
180 NEXT
190 FOR M = 1 TO LEN (C$)
200 X$=MID$(C$,M,1):GOSUB 300
210 IF E =1 THEN A=A-1: GOTO 260
220 NEXT
230 IF T= EVAL("&"+C$) THEN 50
240 PRINT "CHECKSUM ERROR !"
250 A=A-8:GOTO 50
260 PRINT "TYPING ERROR !"
270 A=B*(A DIV B):GOTO 50
280 *SAVE "DOWNLOAD" 6A00 6FB7
290 END
300 E=0: IF ASC(X$)<48 THEN E=1:RETURN
310 IF ASC(X$)<58 THEN RETURN
320 IF ASC(X$)<65 THEN E=1:RETURN
330 IF ASC(X$)>71 THEN E=1
340 RETURN
```

Figure 2. BBC.

```
6A00 :A9C8A0FEA20120F4,4C6
6A08 :FF20616C20486DC9,38A
6A10 :31F00BC934F0E9C9,4CB
6A18 :35F0064C0C6A4C17,280
6A20 :6AA90C20E3FFA9E8,4B2
6A28 :A000A2FF20F4FFA9,4FD
6A30 :03A20020F4FFA902,363
6A38 :A20220F4FFA9C8A0,4C8
6A40 :FEA20020F4FF6049,4BC
6A48 :0C20E3FF20F76A49,439
6A50 :15A20120F4FFA030,3EB
6A58 :A9FF889985FD0FA,5B7
6A60 :A9156A20120F4FF20,394
6A68 :0C6C90F8200C6C80,34B
6A70 :FBA800847784784B4,416
6A78 :79847AE47B857020,3BB
6A80 :D56DA570295C930,4B9
6A88 :D0E220C6C00D099,46B
6A90 :710BC820D5aDC009,364
6A98 :D0F8A020A5742980,422
6AA0 :D008A51C85761085,354
6AA8 :1065785772006C6,4BY
6AB0 :B0B5208EFC82005,524
6AB8 :6DC0100F0A57320,435
6AC0 :B2620DC6C80A0C5,3CC
6AC8 :7AF00A9580E3FF,479
6AD0 :20E7FF4C676A200C,34F
6AD8 :6CD0BCC57BF00A9,48C
6AE0 :5820E3FF20E7FF4C,4AC
6AE8 :676A573A8398F6F,43E
6AF0 :D00C20E7FFA9B20,3BB
6AF8 :E3F74CE36B4C676A,469
6B00 :A000847A847B200C,2C9
6B08 :6C80F291762D56D,477
6B10 :C9C475D0F1200C6C,45A
6B18 :B0E3C07A000A95B,4CE
6B20 :20F4FF99A47EB0F,5BC
6B28 :6120C6C80CFC57B,3C1
6B30 :F00BC95820E3FF4C,447
6B38 :A76A20F7FF,429
6B40 :A573C8A9009856F,3F6
6B48 :A58AC902D05E20D7,419
6B50 :63A9C820556CA955,3B3
6B58 :2830EEA9502056C,299
6B60 :A915C20120F4FF20,391
6B68 :F76BC471CB8B985,505
6B70 :6FD05198D0F7A90C,4A4
6B78 :20E3FF20A56DA95A,437
6B80 :0502096F0503A90F,3D7
6B88 :20004E20FB6D20AB,2D3
6B90 :6DA9052000E6A9B0,2DA
6B98 :20E3FF20FB6DA9D2,502
6BA0 :20E0FF4C0C6AA955,3BF
6BA8 :2030EEA996205C,2DE
6BB0 :4C6A6BA475200C6C,2D2
6BB8 :B3D0FA200C6C200C,316
6BC0 :6C4C4B6B1C6C6AA9,336
6BC8 :2020E3FFA96F20E3,43D
6BD0 :FFA96B20E3FF60A9,51E
6BD8 :9CA000A6BAE0D20,41E
6BE0 :00A21320F4FFA212,387
6BE8 :20F4FF60A9A0E3FF,479
6BF0 :FFA29620F4FF60A9,553
6BF8 :92A000A6BAE0D200,41E
6C00 :E8A25320F4FFA252,4E7
6C08 :20F4FFA0[illegible]A9,44F
6C10 :8F847EA991A20020,3B0
6C18 :F4FF8009C007D005,443
6C20 :636B4C0CaAA47E20,2D4
6C28 :496CC6BFD0023860,374
6C30 :A58AC902D0062079,369
6C38 :6[illegible]
6C40 :20F4FF99A47EB0F,5BC
6C48 :6080A2D2CAE8CA00,50A
6C50 :FDA60A900E47EA8,458
6C58 :20496CB3D0FAA47E,449
6C60 :60A9E0A000F2FF20,452
6C68 :F4FFA90885FAA90C,460
6C70 :20E3FF20A8DA904,3E4
6C78 :20006EA909E5B2A9,2F0
6C80 :6[illegible]
6C88 :20156DC741F00BC9,370
6C90 :42F011C943F0174C,3A2
6C98 :616CA903A20120F4,335
6CA0 :FF4CD763A09QA203,3C4
6CA8 :20F4FF4C87CA90B,433
6CB0 :A20420F4FFE6BAA5,4CE
6CB8 :7C20E3FFA4E20AB,46B
6CC0 :6DA9082000E20FB,2C4
6CC8 :6DA0172815DC941,2D0
6CD0 :F008C942F011C943,413
6CD8 :F0174C616CF907A2,372
6CE0 :0120F4FF4C096DA9,37F
6CE8 :07A2032[illegible]
6CF0 :6DA907A20420F4FF,3D6
6CF8 :E6BAA5BAC9020D0,443
6D00 :A9E8A000A2120F4,3E8
6D08 :FFA57C2BE3FF2803,495
6D10 :6C2B536C6020AB6D,2E3
6D18 :A9052006E20FB6D,2C1
6D20 :20AB6DA9052006E,274
6D28 :20FB6D20AB6DA905,36D
6D30 :200B6E20FB6D20AB,2DE
6D38 :6D847EA9032006E,2A9
6D40 :A9D220E0FF857C60,4DB
6D48 :A90C28E3FF20A86D,3EF
6D50 :A9072006EA99AB5,306
6D58 :82A9E0E03A00020,361
6D60 :FE6D20A86D20996D,3C0
6D68 :2099D20996D20AB,317
6D70 :6DA90A2006E20FB,2C6
6D78 :6C20A36D2902200D,270
6D80 :6E20F86D20AB6D20,34E
6D88 :E3FFA9D220E0FF4B,5AE
6D90 :A50FA20020F4FF6B,3D5
6D98 :60A9082006E20FB,2B7
6DA0 :6020AB6D6020AB6D,33A
6DA8 :20AB6D20E7FF20E7,445
6DB0 :FF604B29F06AaA6A,3FE
6DB8 :6A0930C93A30831E,1F1
6DC0 :69[illegible]
6DC8 :0930C93A30031B65,1F0
6DD0 :0720E3FF60457B8E,3AE
6DD8 :78A20BA57B2A900C,30B
6DE0 :A57B490B857BA57B,390
6DE8 :4910E57A267A267E,299
6DF0 :CAD0EB6020E3FFCE,5AC
6DF8 :B.B2C90D00F6CB6E,4F7
6E00 :B67DAAA9202023FF,478
6E08 :[illegible]
6E10 :D00BA9B620F4FF60,4F0
6E18 :00F012A97FC920B0,3C3
6E20 :0EC90AF00AC90DF0,3A1
6E28 :0[illegible]
6E30 :857CB67D847E9991,448
6E38 :A20120F4FFA903A2,484
6E40 :0720F4FFA996A208,403
6E48 :20F4FF9B29B2F0F4,4BA
6E50 :A47C997A20920F4,41F
6E58 :FFA903A20420F4FF,464
6E60 :A991A20020F4FF00,49F
6E68 :09C007D0056B684C,2C1
6E70 :0C6A57CA67DA47E,5DC
6E78 :60E47E867D099A02,34A
6E80 :0020F4FF9B2901F0,3CD
6E88 :0BA996A20920F4FF,408
6E90 :9010901380A67DA4,340
6E98 :7E40444F574E4C4F,2B1
6EA0 :4144494E4720404S,215
6EA8 :4E50D312020202052,193
6EB0 :4543454956450034,1F2
6EB8 :2020205345542042,1AE
6EC0 :61756420526174650,2E6
6EC8 :0D2520202055849,188
6ED0 :5420544F20424153,20D
6ED8 :4943004545445552,217
6EF0 :20455[illegible]
6EE8 :2020553452044354,1EC
6EF0 :524C2047204544F20,1F5
6EF8 :5245455524E2054,254
6F00 :4F204D454E552029,1ED
6F08 :0D5345420545241,200
6F10 :4E534D4954204261,24E
6F18 :7564205261746500,292
6F20 :4120202037352042,16F
6F28 :61756400422020333,1FC
6F30 :3030204261756400,209
6F38 :4320313230302042,18B
6F40 :61756400534554420,253
6F48 :5245434545454520,223
6F50 :4261756420526.74,2C3
6F58 :6580D5024F47524,23D
6F60 :4D20204C4F414445,1F2
6F68 :4420206F6B0D5052,20D
6F70 :4555552041[illegible]
6F78 :4B455920464F5220,210
6F80 :4D454E550202020,1A2
```

Figure 1. Spectrum.

```
5 REM SPECTRUM 48k        fig 1
10 REM Hex Code Loacer
15 CLEAR 59000
20 POKE 23658,8: CLS : PRINT
30 INPUT "Start Address ";a
50 IF a>41135 THEN GO TO 200
60 IF a<60000 THEN GO TO 20
70 PRINT a;
80 INPUT " :";b$
85 IF b$="END" THEN GO TO 280
90 IF LEN b$<>32 THEN GO TO 260
100 LET t=a*256*INT (a/256)
110 FOR n=0 TO 7
120 LET x$=b$(2*n+1 TO 2*n+1)
125 GO SUB 300: LET v=x
130 IF e=1 THEN GO TO 260
140 LET x$=b$(2*n+2 TO 2*n+2)
145 GO SUB 300: LET v=v*16+x
150 IF e=1 THEN GO TO 260
170 POKE a,v: LET a=a+1
180 LET t=t+v: NEXT n: LET y=0
190 FOR m=1 TO 3
200 LET x$=b$(17+m TO 17+m)
205 GO SUB 300: LET y=y*16+x
210 IF e=1 THEN LET a=a-1: GO TO 260
220 NEXT m
230 IF t=y THEN PRINT ";";b$: GO TO 50
240 PRINT "Checksum Error"
250 LET a=a-8: GO TO 50
260 PRINT "Typing Error"
270 LET a=8*INT (a/8): GO TO 50
280 SAVE "download"CODE 60000,1136
290 POKE 23658,0: STOP
300 LET e=0: LET x=CODE x$-48-7*(x$>"9")
310 IF x<0 OR x>15 THEN LET e=1
320 RETURN
```

Figure 2. Spectrum.

```
60000 :CD15EDC307ECCD15,4C7
60008 :EDCD36ECCD66EDCD,631
60010 :30EDCD47EE30FCD,3AF
60024 :BBEDFE31CA99EA7E,69A
60032 :35CAB7EAC366EACD,5D0
60040 :15ED3EFACDB4EDCD,3FD
60048 :15EDC9CD15EDC364,553
60056 :EACD66ED11E5EE06,58C
60064 :B03EFF1213:0FCCD,45B
60072 :15EE11CDEE06173E,3D2
60080 :20121310FCCD1FED,3DA
60088 :30F4CD50EDCD1FED,5BB
60096 :3BFB3265EF3E0032,3E9
60104 :6CEF326FEF3270EF,544
60112 :3A65EFCDEBEC3A65,5A1
60120 :EFE4F0FE0020DE0E,627
60128 :091165EFCD.FEDDA,501
60136 :AAEA1312CDEBECCD,552
60144 :20F23A69EFE6B020,51A
60152 :0D2149D3C3A0BEF0E,30C
60160 :0047092268EF0E00,1DA
60168 :11CDEECD1FED309A,47F
60176 :12130CCDEBEC79FE,45C
60184 :1020F03A60EFCD01,447
60192 :ECCD1FEDDAAAEA21,574
60200 :6FEFBE28133E5B11,326
60208 :E0EE12133E00:2CD,340
60216 :D7ECCDA6ECC3AAEA,6B:
60224 :CD1FEDDAAAEA217B,518
60232 :EFBE28E121E5EE3A,524
60240 :6BEFB56FCE000C67,3CC
60248 :5E000E2008CD0FEC,40F
60256 :3E213280SCC3FFEE,402
60264 :3E00326FBF3270EF,3C7
60272 :EDSB69EF0E00CD1F,40C
60280 :EDDAAACA273FCE,634
60288 :EBEC3A6BEFFE002E,506
60296 :023A69EFE6003A73,432
60304 :EF12130C3A6AEFB5,3FC
60312 :22DCCD1FEDDAAAEA,5DB
60320 :216FEFBEC22DEBCI,504
60328 :1FEDDAAAEA2170EF,5A2
60336 :BEC22DEB3E6F32E2,589
60344 :EE3E6332E3EE3E00,498
60352 :32E4EE3ABB5CFE21,501
60360 :2E03CD15EECDD7EC,553
60368 :CDA6EC21E5EE3A6E,5C5
60376 :EF056C3E000C6734,422
60384 :0021D3EEEU4B66EE,561
60392 :0C7EFE00C2BDEA23,4FC
60400 :0D20F53EFACD84ED,5B9
60408 :3E01D3FEC366EACD,5E8
60416 :1FED30FDC3DDCAF3,B24
60424 :0603A7DF3FF10FB3E,3DB
60432 :40D3FF3EFFD3FF3E,56F
60440 :31D3FF3E0F320F5C,385
60448 :320D5C324B5C3E01,2D0
60456 :D3FE21915CDB9EFB,56B
60464 :CD50EDC366EACD15,52F
60472 :EECD66ED3E01D3FE,556
60480 :21B5EE3E00CDBFEC,442
60488 :CDE4ECCDA3ECCDA6,654
60496 :EC23CD77ECCD77EC,5BF
60504 :CD00ECCDB4ECCDA6,661
60512 :CC233E0DCD0FECCD,4CF
60520 :B4EC23CDA3EC3E03,498
60528 :CDBFECCDB4ECC9CD,68B
60536 :A3EC3E07CDBFECCD,561
60544 :B4FC23C97FFF00CA,520
60552 :CDEBED23C3B4ECFE,651
60560 :00C0F53E20CDBBED,520
60568 :F13DC30FECCDBAEC,650
60576 :CDA3ECCDA6EC3E0D,5A6
60584 :CDEBED3EFF32BC5C,574
60592 :C9F513E6F0CB1FCB,60C
60600 :1FCB1FCB1FF630FE,4CF
60608 :3AFAC6ECC6071213,498
60616 :F1E6[illegible]
60624 :D4ECC6071213C921,46C
60632 :CDEEE5CDB4ECE:06,69C
60640 :173E2077231DFC3E,339
60648 :0077C9E5217BEFDE,53B
60656 :77C50E0B7EA7CB17,449
60664 :300D7EEE0E773A6F,3C9
60672 :E7EE10326FEF3721,3D5
60680 :6FEFCB1623CB16D0,35B
60688 :20E2C1E1C9110501,394
60696 :216A00CD0503C93E,32F
60704 :963277EFCD47EDDA,529
60712 :2EEDF1C366EACDAC,500
60720 :ED7BE601F602D3FE,548
60728 :AF2177EF35200237,2FC
60736 :C9CD77ED3E0EC9CD,0F0
60744 :4766DDFECDC9370C9,5E6
60752 :F5DBFF3A01EFFE00,5C7
60760 :2B043E361B023E37,187
60768 :D3FFDB7FF1C9F53A,675
60776 :81EFFE002B043E36,376
60784 :D3FFCD50EDF:C93E,644
60792 :00DBFFE60037C8D8,59.
60800 :FFE60237CBDBFFE6,626
60808 :302004DB7FA7C93A,3E0
60816 :B1EFFE0020043E37,397
60824 :1B023E36D3FFDB7F,452
60832 :C9CD47ED3A73EFDB,5DE
60840 :F1C366EAF53ED23D,5EE
60848 :20FDF1C9CDACED3D,62A
60856 :20FAC9CD5D5E5F5FE,70D
60864 :7F2013CDF9EDFE0C,537
60872 :200CFE0C20053E20,28A
60880 :D73C8DD71D103EC0,34F
60888 :D73E8D73A885CFE,4EB
60896 :212B033E08D73EEF,2E6
60904 :D73E08D7F1E1D1C1,640
60912 :C9FE0720FCFECD20,4F3
60920 :19FE0C2B14FE0020,300
60928 :10FE0D20DCFE28FA,367
60936 :0FEEFE30FA11EE3E,4BA
60944 :00C93E07C9CD680D,32C
60952 :3E02CD8116E1832,1C4
60960 :B95CC93E121601CD,302
60968 :1122C93E121600CD,257
60976 :1122C9C5D5E53E02,3EB
60984 :CD0116CD47EE3BFB,451
60992 :CD5CEEE1D1C1C93A,5CD
61000 :3B5CCB5F280C3A0B,28F
61008 :5CF5213B5CCBAFF1,4C3
61016 :A7C93729F5111800,3DE
61024 :CD18ED[illegible]1C9444F57,4D6
61032 :4E4C4F4144494E47,2B4
61040 :204D454E550031 20,216
61048 :2020524543454956,276
61056 :4500352020204578,217
61064 :697420746F204261,32B
61072 :7369630202005573,2DF
61080 :652053796D626F6C,3V3
61088 :2020535966742B2D,30B
61096 :204700746F205265,2C9
61104 :7475725E20746F20,39C
61112 :4D464E5B202904B,27B
61120 :4E5445522D4E554D,309
61128 :424552200000000,1C1
```

EXTENDED VIC BASIC

THE PROGRAM, when run, provides the Vic-20 with an extra 25 keywords where 23 are commands and two are functions. The extra commands utilise sound, colour and graphical aspects of the computer. There is a resolution of 160 by 192. Double height and user-definable graphics are catered for in the package. There is also a special key scanning function to allow multi-key input similar to the Inkey function on the BBC machine. Colour manipulation to produce animation is also a key feature. The use of tokenised keyboards results in no speed decrease.

A list of commands is provided on printer paper plus two demo programs, Poly Organ and Beekeeper. The demos contain no Pokes.

As the program is of total machine code it will be impossible to convert even to a machine like the CBM-64. Most computers anyway have a reasonably extensive Basic.

Loading — Press Shift Lock; press Run Stop; depress Shift Lock and press Play on tape.

The Extra commands:

■ **OPERATION MODES:** Each mode command initiliases the normal Vic-20 colour and sound channels.

MODE0 — sets the normal text screen.

MODE1 — sets normal screen with 192 definable characters.

MODE2 — sets the 15 line screen with double height characters.

MODE3 — sets the hi-res screen with 192 lines of 160 pixels.

■ **COLOUR COMMANDS:** all colour commands can be used in all modes.

INK x — sets the current ink colour to x (0-15). Values above 7 sets the multicolour mode.

AUX x — sets the auxilliary colour to x (0-15). For use in multicolour graphics.

VDU x,y — sets the screen colour to x (0-15) and the border colour to y (0-7).

GCOL x — changes each colour on the screen by x amount for example with GCOL1 black becomes white and white becomes red and yellow becomes black etc. GCOL7 reverses the process above the GCOL4 causes a flashing effect. Don't use with multicolour characters.

GCOL x,y — changes everything with colour x (0-15) to colour y (0-15).

■ **SOUND COMMANDS.**

VOL x — sets volume to level x (0-15).

CHAN x,y — sets sound channel x (0-3) to value y (0-255).

SOUND I,J,K,L — gets all four channels to the values of the variables.

■ **HI-RES COMMANDS.**

CLG — clears the hi-res screen.

SET x,y — plots a pixel at column x (0-159) and line 7 (0-191) in the current ink colour. The top left corner is the origin (0:0).

RESET x,y — unplots the pixel at column x (0-159) and line y (0-191).

■ **SCREEN COMMANDS.**

AT x,y — puts cursor at column x (0-21) and line y (0-22). For use in modes 0-2.

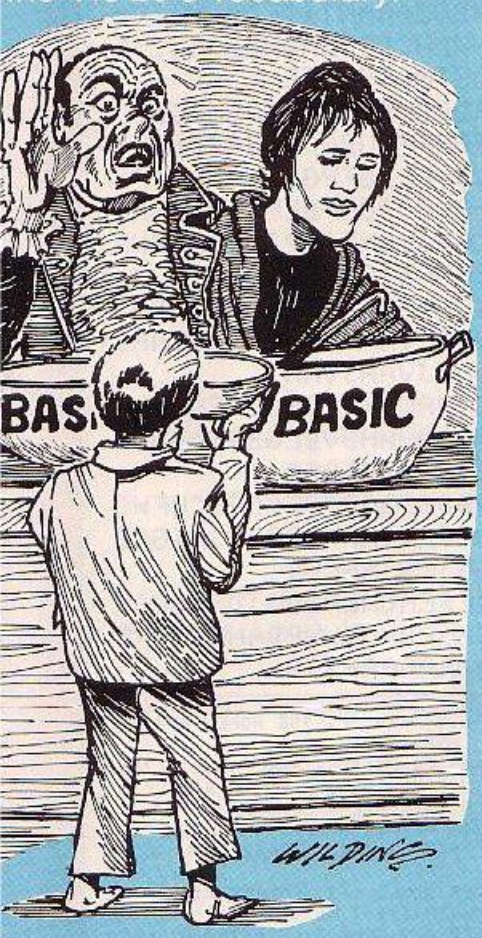
CLS — clears text screen. Don't use in mode 3.

INV — inverts screen display. A second

Program 2.

```
0 SYS58648:PRINTCHR$(8)SPC(49)"P
LEASE WAIT !":S=0:A=36:B=8192:GO
SUB6:A=2:B=673:GOSUB6
1 IFS<>177116THENPRINT:PRINT"CHE
CK-SUM ERROR":PRINT:END
2 SYS680:SYS58648:POKE780,54:POK
E782,228:SYS51998:PRINT"  DFR EX
TENDED BASIC":PRINT
4 PRINTCHR$(157)(PEEK(644)-38)*2
56-1"BYTES FREE":POKE198,0:NEW
6 FORI=0TO9:READA$:FORJ=0TO38:F=
(ASC(A$)-65)*26+ASC(MID$(A$,2))-
65:S=S+P
8 POKEB+I*39+J,P:A$=MID$(A$,3):N
EXT:NEXT:RETURN
200 DATA BGEUHPGEAFHDJRABJGDJHTB
IJGCTHTCNFOCMHTDNGUCIFCGVGGAAFEA
LCEJTJDBGJGATHTEYJGAWHH
201 DATA JDBGJGBNBWADIYIAJMIWALG
IGVGNHSHDJRABIYIAIQGKGVGJALAYEBH
WGBJRABHSIYHDJRABGBJRAB
202 DATA IAJMGIGVHSIAGUHSHDJRABJ
GAGHTBIIAJMJGJHDSAIHTJVJGBQBKAPB
WBMHTHWFOBIBOCEIZHVGOFC
203 DATA CVGEJVHUJGAIHSHDJDBGAQJ
QBWJLHSHDJDBGBWAFBGICJVIAJLCYJFH
QBOCYBAHRGEABGVESHTHWFO
204 DATA AZHTITGUAVCEIZHVAKGMHDH
CBGFDJSHDHBBGFDJRBGGFACEEJRAADSA
HHZDABHAWBIBBBIBEBIBHBI
205 DATA BTBICABICWBIDZBIERBIFEB
IFYBIAUBJCABJFDBJFYBJHFBJHRBJIMB
JITBJJCBJJQBJBABKIEBKCC
206 DATA BLAHHZCZDBCQHPCPCYHMCPC
YIDCPCYHRCNIECVDAHVCNDHIIDICQIFD
IDBHWCPCUCNHYDFDBDHDAHO
207 DATA DFCRIEDEDFCRIECTCPDBHWC
JCNCYIEDHCQHRCPCUCNCVHYDCDHIEDED
CIECVDAIGDHDCIDCQDAIDDC
208 DATA CYCNCPHPCPCUCNICCXCRIJA
AAAAAAAAAAAAAAAAAAAAAEGAYIVBGIAA
CHTAAIAABDSHTABIABSGNAA
209 DATA GMFDDJFDDLGNAUFDDKGNEYF
DDMGVDLFPDJHSIAJPIWDMGKDKIYFEDKI
QBGIAJEGNAIBGCOIXGNHKFL
```

David Redmond expands the Vic-20's vocabulary.



Sir, can I have some more.

INV normalises screen.

PLACE k,c,x,y — Puts screen code character k on the screen with colour c at column x and line y. It will accept any multiple o of for parameters. It works in all modes but the screen in mode 3 is treated as 20 columns. To get lower case characters in mode 3 use POKE 9329,136 and normal upper case is POKE 9329,128.

UPS x — scrolls screen upwards x times. Don't use in mode 3.

DNS x — scrolls screen down x times. Don't use in mode 3.

■ OTHER COMMANDS.

CLB — clears the keybcard buffer. Poke 198,0. Halt x stops program execution for x 60ths of a second so halt 30 will wait for ½ a second.

CHAIN — ends the program and loads and runs the next program on tape.

PUT x — outputs ascii characters x to the current output device. Can have any number of parameters eg. PUT8,14 locks Vic in lower case.

RPTx — repeat key facility

RPT0 — Normal

RPT64 — No keys repeat

RPT128 — All keys repeat

UDG I,J,K,L,M,N,O,P,Q — creates user defines character I (0-19) where I is in screen code. The remaining eight variables relate to the 8 lines of pixels. To redefine a double height character its screen code number must be multiplied by 2 for the value of I and then redefine two characters.

Program 1.

```
2 POKE648,16:SYS58648:PRINTCHR$(
8)SPC(24)"PLEASE WAIT WHILST"SPC
(31)"LOADING"SPC(60)
4 POKE9728,0:POKE9730,0:POKE43,1
:POKE44,38:POKE45,3:POKE46,38:PO
KE198,1:POKE631,131
```

Only the first 96 double height characters can be redefined.

KEY(x) — is a function and returns a value of either 0 or −1. If key x is down −1 is returned also 0 is returned. The value of x has to be in PEEK(197) key code. This sort of key testing allows multi key input.

IFKEY(X)THEN — tests for key x down.

IFNOTKEY(X)THEN — tests for key x up.

CHAR(x,y) — is a function and returns the screen code of the character at position x and y. Not for use in mode 3. Parameters in commands can be variables. Expressions. Formulae or even numbers.

To enter the program first save program 1 on tape then type in program 2. When it runs without an error message save it after program 1.

All commands can be placed within print statements between semicolons. If a command is entered directly from keyboard a syntax error might result. An extended basic command after a Then statement must be preceeded by a colon, for example:

IFX<160THEN:SETX,Y

KEY CODE TABLE

C	1	2	3	4	5	6	7	x8
C	1	÷	1	#		$	Q	2
1	2	W	A	%	Z	S	E	4
2	5	R	D	X	C	F	T	6
3	7	Y	G	V	B	H	U	8
4	9	I	J	N	M	K	O	0
5	+	P	L	,	↑	:	e	—
6	£	%	;	/	&	=	?	'
7	(	)	[	]	f1	f3	f5	f7

: = CTRL # = STOP $ = CBM / = LSHIFT
? = Uparrow ' = HOME (= DEL) = RTN
(= CRSR) = CRSD.
For example key H = 5 × 8 + 3 = 43
CTRL key = 2 × 8 + C = 16

```
210 DATA AFFODSHTACIACTGNAAGMFDD
JFDDLGNAUFDDKGNEYFDDMGVDLFPDJHSF
PDJFGIWDLIAAJGKDMIYIQFE
211 DATA JGAOFEDMGJDJAYEBACFDDJF
OISAYIWDKFOINGNHXFLAFFOGNBFFLADF
OGNAYFLABFOGNAICYCOIXGG
212 DATA JVFIGBJGAPHUIQAPIAJNGNJ
GFDBMGNAGFDBNGNAAGMFPBMIWEMIAJQI
WBNGJBNHTBGIAJFGNAIBGCO
213 DATA IXGNHWFLAFFOGNAOFLAAFOG
NBJFLABFOGNAUFLACFOGNAZFLADFODSG
NAAFDHQDSCYDRIVCYIOBHBG
214 DATA IAACGMBGHXACGOAYCYAKIVB
GIAACFLFEACDSGRAOFOBPAPFDHNBGIAA
CBPAPAKAKAKAKAFHNFLAOFO
215 DATA DSBGIAACAKAKAKAKFDHNBGH
XACBPAHAFHNFDHNGRAPFOBPAIAFHNFLA
PFODSGRAOFOBPJGFDHNBGIA
216 DATA ACBPAPAFHNFLAOFODSBGIAA
CBPADGOBGHXACGEAKFODSBGIAACFLAKF
OGGAABGHXACGBALFOIYIQAD
217 DATA IAJLDSBGIAACFLJUACBGHXA
CFLJVACGNAQFDBNFDBPGRJUACCUCWCWC
WFDBMGRJVACCWCWCWCWAKAK
218 DATA AKAKCUFDDWCWCWAYDXDWDXB
MFDBMGEAAEAFDBQGJDXCEIVBQFDBOGNA
AGGAGAYEJBMFOACIWBPHUIA
219 DATA JMAYDXBOFDBOEABPAHCVAHG
OGNABHUBWAEAKAYFOJPJAJAARBOFPBOG
RJQBIHTJAIAAMGJBNAYEBFC
220 DATA FDBNGRFEACFPBMDSGNCVFLJ
QBIGNJVFLJRBIGNBXFLJSBIBGFYBIGNJ
AFLJQBIFLJRBIGNARFLJSBI
221 DATA DSBGIAACGOGEABGVESHTBSJ
GBEGNFSFDBNGNAAFDBMGGACGEAAGVBMA
YDXDXBPAHFPBMHSIAJKIWBN
222 DATA HUIAJDDSFIFDHNBGHXACGNF
SFDBNGNAAFDBMGGACGEAAGVBMBPAPHPH
NIAAEGJDXFPBMHSIAJHIWBN
223 DATA HUIAJADSBGIAACAYDXGGGOG
JDWDXGFGMIUGGIAJSHOGFIAJODSBGIAA
CCUCWCWCWCWCWAYEBAUFDBN
224 DATA EAAKAKAKFDBMGEAABGHXACF
PBMHSHKAIIAJMDSGNABFDHQGNFBFLEPA
CCYETHOBGIAACBGESJIGEAE
```

(program 2 continued on next page)

(program 2 continued from previous page)

```
225 DATA GVESHTBSIAAGBGHXACAYFOJ
FDSBGIAACFLFIACDSGRAPFOCVAIFLAPF
ODSBGIAACCUBGENIZEAGOHU
226 DATA FIIAJMDSBGIAACCUGJIGCUG
NJVFDIGGNIJFDGCBGJEIZEAFDIGGNFOF
DIJEAGOHUFIIAIUDSEQBGIA
227 DATA ACCUGRAFFOHTHWJGCOBGHXA
CCUGNAQFDGZBGHXACCUBGHXACGOEAIQA
AJGAKAYEBAWFOACIWGZHUIA
228 DATA JMFDGYFDBPGJGZAYEBFCFDB
QGEAAEAFPBPEAFPGYGEABGVESHTBSIAA
GBGEOAAAYFOGZDKDSEACUCW
229 DATA CWCWCWCWAYEBEYFDHOEAAKA
KAKFDHNBGHXACCUBGHXACFDBMGNFSFDB
NBGHXACCWGOGEAAAKHPDXJG
230 DATA ACGEAIFCHJHUBWANGNAUAYD
XBMFDBMFOACIWBNIAJGGEAAEAFPBMGJB
NCEIZFSFDBNGGAEAGBMBMBN
231 DATA HUIAJPGJBMAYDXHJFDBMGNA
RDXBNFDBNGEAHGVHNFPBMFGAQJPCYDKB
KBGJQHYBGGCIHFICUBGJTHY
232 DATA GNAAFDBMGNAQFDGZBGGCIHF
IGGAVAYDXDXFOACIWGZHUIAJMFDGYBGJ
NHYEAGMGVGYGMCYGGIDGNAA
233 DATA FDANBGEOAAHTITFOAUHTIVG
UAQCEIZHVAKGMHDHCBGCUHDHBBGCUCYE
OAAGJESIAACHQETHQESCYFE
234 DATA HYAABGDUBGIUHRAFBLEQBGJ
HHYGRBGFPCUGRBHFPCUBGGOIBGJDXCWC
WCWGOBGEPBLCVJVFLBGFPGJ
235 DATA DXBPAHGOBGEPBLFDBOGRBHF
PCVJVBLBOJGACGNJVGMBGFPIDEAFLBHF
PEAFLBGFPDKDSGNABIQAAJG
236 DATA AEAKHUIAJSDSCCBSAAJVAAJ
VAAJVAAJVAAJVAAJVAAJVAAJVAAJVAAJ
VAAJVAAJVAAJVAAJVAAJVAA
300 DATA IWESIAACIWETDSGGAFHHHUA
CGBELAAHUAQJNGGAHHHBVBLGBAEADHUA
QJNGNAQFLFGACCYAYIVAAAA
301 DATA AAAABGFTBGBGGFACFICUFWC
UBGGFACBGGCIHHTAAIAAMHPGBJGAIGGD
KGBAAACHUAQJQGJESIAACHQ
302 DATA ETHQESEAGMEAGOGJDXDSAAA
AAAAAAAAAAACGHOFBHOEUHPBAHRIUHRF
EHYAAAAAAAAAAAAAAAAHJJA
```

Demo program — Beekeeper.

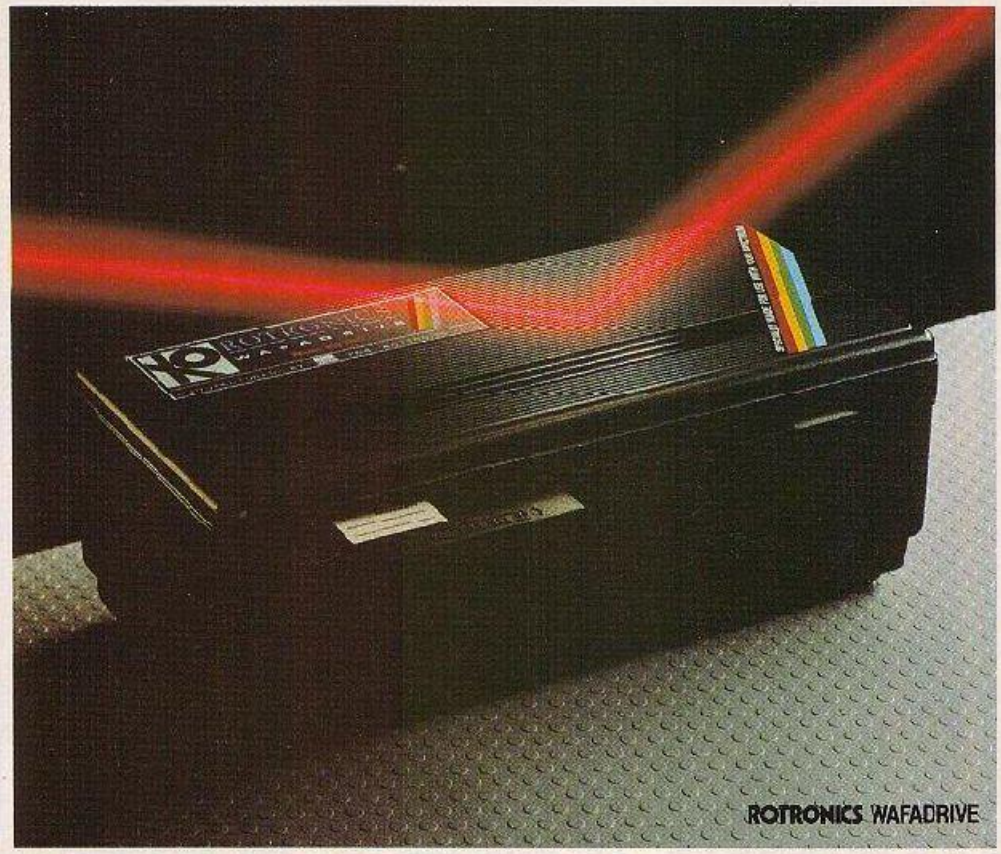
```
10 GOSUB1000
15 GETK$:IFK$=""GOTO20
17 G=DX:H=DY:DX=(K$="[redacted]")-(K$="[redacted]"
):DY=(K$="A")-(K$="Z")
18 IFDX=0ANDDY=0THENDX=G:DY=H
20 I=X:X=X+DX:J=Y:Y=Y+DY:IFX<0OR
X>21THENDX=-DX:X=I
25 IFY<2ORY>14THENDY=-DY:Y=J
27 IFCHAR(X,Y)=36GOTO40
28 IFCHAR(X,Y)=35GOTO60
30 PLACE32,0,I,J,37,4,X,Y:GOTO15
40 S=S-1:FORZ=200TO175STEP-1:CHA
N2,Z:NEXT:CHAN2,0:IFS<0THENS=0
45 GOTO70
60 S=S+1:P=P+1:FORZ=225TO250:CHA
N2,Z:NEXT:CHAN2,0
70 PRINT"[redacted]"TAB(12)S"[redacted] ":IFP<25GO
TO30
75 SOUND0,0,0,0
80 FORI=1TO20:FORZ=7TO0STEP-1:GO
OL1:VDU0,Z:CHAN2,128+Z-T*5:NEXTZ
,T:SOUND0,0,0,254
82 CLS:PRINTAT0,5"YOUR SCORE IS"
S"/ 25":FORV=15TO0STEP-.05:VOLV:
NEXT
85 INK0:PRINTAT0,6"ANOTHER GO ?
(Y/N)"
90 GCOL4:IFKEY(11)THENRUN
95 IFNOTKEY(28)THEN:HALT10:GOTO9
0
100 MODE0:CLB:END
1000 MODE2:UDG70,254,124,56,254,
130,170,170,170:UDG71,186,186,17
0,170,170,130,254,0
1001 UDG72,36,24,24,36,36,126,12
6,66:UDG73,66,126,126,36,36,24,2
4,36
1002 UDG74,0,126,129,165,165,165
,129,153:UDG75,153,129,129,189,1
53,129,126,0
1003 PRINT'  *** BEEKEEPER ***";
A~0,3;INK4"GET THE HONEY POTS [redacted]#
[redacted] AND AVOID THE ";
1005 PRINT"BEES [redacted]$[redacted].";AT0,6;INK2
"ONCE MOVING YOU CAN'T STOP.",AT
3,9;INK5"A/Z---UP/DOWN"
1010 PRINTAT3,10"CRSR--LEFT/RIGH
T";AT2,13;INK1;"PRESS CTRL TO GO
!":I=0
1015 GCOLI,1-I:IFNOTKEY(16)THEN:
HALT10:I=1-I:GOTO1015
1020 CLS:VDL0,0:PRINTTAB(6)"[redacted]SCO
RE: 3","_____":
FORI=0TO1:FORJ=1TO25
1025 X=INT(RND(1)*22):Y=INT(RND(
1)*13)+2:IFCHAR(X,Y)<>320R(X=10A
NDY=7)GOTO1025
1030 PLACE35+I,6+I,X,Y:NEXTJ,I:X
=10:Y=7:DX=0:DY=0:P=0
1040 FORI=128TO254:VOLI/16:SOUND
I,I,I,0:NEXT:SOUND0,0,0,0:CLB:RE
TURN
```

Demo program — Poly organ.

```
10 GOSUB1000
20 X=0:FORI=0TO2:S(I)=0:A$(I)="
 ":NEXT
25 FORI=0TON:IFKEY(K(I))GOTO50
30 NEXT
35 O=12-O:VDUO,7
40 FORI=0TO2:CHANI,S(I):PRINTAT5
+I*5,8A$(I):NEXT:GOTO20
50 S(X)=A(I,X):A$(X)=N$(I):X=X+1
:IFX=3THENX=2
60 GOTO30
1000 MODE0:PUT8:VDU8,7:VOL8:O=8:
N=12:DIMA(N,2),K(N),S(2),N$(N),A
$(2)
1010 FORI=0TO12:FORJ=0TO2:READA(
I,J):NEXT:READK(I),N$(I):NEXT
1020 FORI=1TO8:INK1:FORJ=0TO5:PR
INTAT2+I*2+(I>3)+(I=8),15+J"[redacted]":
NEXT
1025 IFI<>3ANDI<>7ANDI<>8THENFOR
J=0TO3:INK0:PRINTAT2+I*2+1+(I>3)
,15+J;"[redacted] ":NEXT
1030 NEXT:INK0:PRINTAT5,16;"[redacted]S[redacted]D
[redacted]G[redacted]H[redacted]J";INK1;AT4,19;"[redacted]Z[redacted]X[redacted]CV[redacted]B[redacted]
N[redacted]M<"
1040 PRINT"[redacted]** POLYPHONIC ORGAN
 **":INK0:PRINTAT7,4"CHANNEL";AT
5,6"0    1    2":RETURN
2000 DATA223,191,128,33,"C ",225
,195,134,41,"C#",227,198,141,26,
"D ",228,201,147,18,"D#"
2002 DATA230,204,153,34,"E ",231
,207,159,27,"F ",232,210,164,19,
"F#",234,213,170,35,"G "
2005 DATA235,215,174,43,"G#",236
,217,179,28,"A "
2010 DATA237,219,183,20,"A#",238
,221,187,36,"B ",239,223,191,29,
"C "
```

4 FREE WAFERS INCLUDING SPECTRAL WRITER WORD PROCESSOR

As a result of SMT's purchasing power, we are now able to offer the superb Rotronics Wafadrive data storage system for only £99.95*. But hurry! Stocks will not last long. You've read the reviews. Now's your best chance to buy!



SMT Special offer!

Wafadrive only £99·95*

*Plus VAT and £2.00 post and packing

Integrated System

The Wafadrive is a complete system which contains the micro interface, two 128K drives, RS232 and Centronics ports, all in one attractively-styled, compact unit. There is a minimum of connecting leads and no extra boxes to clutter the desk top. Like the majority of professional systems, the units are dual drive. This offers the optimum balance between system flexibility and cost. Built-in serial and parallel interfaces allow the direct connection of just about any popular printer.

Fast and Reliable

The Wafadrive achieves very fast loading and saving, but not at the expense of reliability. Extensive research and the use of high grade materials ensure that the Wafadrive will give years of dependable operation. Data integrity is on a par with floppy disk. Three fully interchangeable blank wafers in three sizes – 128K, 64K and 16K – are also included. Low capacity wafers give faster access. They are therefore most suitable for program development applications. The high capacity wafers are suitable for more general data storage. Loading rate is well over ten times as fast as cassette!

Software

Armed with the comprehensive user manuals, blank wafers and superb Spectral Writer word processor, you'll have a professional system to be proud of. See the coupon below for details of the rapidly growing range of software to enable the programmer and games player to exploit the Wafadrive system to the full.

Buy Now!

Cheap, reliable mass data storage for the Spectrum has finally arrived – make sure you benefit from SMT's special offer. Clip the coupon below and your order will receive immediate attention.

FOR USE WITH THE SINCLAIR SPECTRUM

Please send me (enter as appropriate):

___ ROTRONICS Spectrum Wafadrive(s)	@ £117.24 each	___
___ 16K wafer(s)	@ £3.45 each	___
___ 64K wafer(s)	@ £3.65 each	___
___ 128K wafer(s)	@ £3.95 each	___
___ Heathrow/Nightflite II	@ £14.95 each	___
___ Space Wars/Seiddab Attack/Luna Attack	@ £14.95 each	___
___ BearBovver/Wong's Loopy Laundry/World Cup	@ £9.95 each	___
___ Starbike	@ £7.95 each	___
___ ZAP machine code	@ £19.95 each	___
___ Sherlock	@ £14.95 each	___
___ RS232 lead	@ £9.95 each	___
___ Centronics lead	@ £9.95 each	___
All prices include VAT and P&P	TOTAL £	___

☐ I enclose a cheque/PO* made payable to SMT

☐ debit my Access/Barclay card* account no.

(*delete as applicable)

Signature:

Name:

Address:

Send to (no stamp required): SMT, FREEPOST, Greens Norton, Towcester, Northants, NN12 8BR

Please allow 28 days for delivery.

YC/3/85

SMT

Mail Order Protection Society registered number 3282/152

Program 2.

```
60000  CD18571FD3653338  = 415
60008  3E3F09822CD0800C  = 789
60016  FDC0028511F96C01  = 967
60024  3D22CD3220D60221  = 402
60032  6D5811220D63419  = 371
60040  20FBFD3B5F83E5F6  = 985
60048  D73E0AD73E16D7DD  = 1022
60056  CB024E23083E4FD7  = 687
60064  5E4ED7180FD3555  = 754
60072  573E4FD73E16D7FB  = 858
60080  45D7FD5B5B3E1F6  = 819
60088  D73E11D73E16D72A  = 888
60096  B45CED5B3871A7ED  = 1173
60104  52CD17B33E16D73E  = 774
60112  12D73E18D72A3E71  = 754
60120  CD1789F3365538FD  = 1003
60128  CB30CD0C7296106  = 949
60136  0221287ED3120EB  = 835
60144  110571C7ED5B2B2B  = 708
60152  1147C11F5E5E5E5E  = 621
60160  CD5120C1C7D5D5D5  = 1053
60168  51E319C1AA39CDE1  = 1000
60176  89CD356BCD3A6AD8  = 1077
60184  217571140710108  = 653
60192  20ED30CB9592018  = 984
60200  214130112C3CCD5B  = 547
60208  99CD97CBCD74080  = 1140
60216  D8FE152DF22D6563  = 1200
60224  CD635E11F71A7ED  = 1119
60232  12223267F12A3871  = 564
60240  1B2D2D3D37BE18  = 1051
60248  6D7A1D3D3110000C  = 477
60256  012120C3B89060A  = 499
60264  CD7359C1B59318A1  = 1012
60272  BD483E7178122849  = 849
60280  2A3271113001B5  = 495
60288  8E03B6011430101  = 908
60296  EB7323730B78B120  = 809
60304  BA2B3571E511400  = 711
60312  19E5B2B7128A3571  = 665
60320  6B2B3571D1B3571  = 711
60328  D1B3571B8ED8B471  = 1148
60336  217271D50ED8021  = 725
60344  7E710E03ED80216D  = 816
60352  710E02ED8021357I  = 744
60360  0E02ED3ED533471  = 914
60368  FD5B3A7121AF71FD  = 1023
60376  4B6D72ED8D5333  = 1036
60384  71A3E7123223571  = 574
60392  2A3571328F77E05B  = 863
60400  5E7112A7ED5222A3  = 755
60408  CD7D5B5B5B5B5B  = 817
60416  7112A7ED5222A371  = 822
60424  C9CD968D8CDB969  = 1122
60432  C8596CD6E68C359  = 1090
60440  82CD968D8CDB969  = 1319
60448  C8596CD6F63C9ED  = 1269
60456  553E717AFE5002006  = 630
60464  79FE01CA1068E511  = 946
60472  1D0219SE2356E3ED  = 828
60480  53E571EE2356E3ED  = 790
60488  5367E1EE2356E3ED  = 1051
60496  53A7ED5214D03E1  = 1094
60504  D1ED8D1ED533471  = 1134
60512  132A3671ED533671  = 715
60520  ED483C71ED8ED83  = 1213
60528  3572A6871111400  = 466
60536  H7ED5B2B5B2B6871  = 1196
60544  19E5E5A3A71A7ED  = 1104
60552  E3444D03E1D1EDE0  = 1077
60560  CD1E5133712A3E71  = 733
60568  2322E717CB5C030  = 607
60576  E3444D03E1D1EDE0  = 801
60584  1B0019E5E2356EA  = 822
60592  6971A7ED523002A  = 601
60600  6371EBA7ED52E8ED  = 1411
60608  111400A7ED52D1EB  = 667
60616  2D3D7B2D3D7B120  = 638
60624  D5C330632A2E7370  = 897
60632  B5C811A7D0213800  = 734
60640  C3EB6921407108  = 673
60648  43FDCB02C6DE6C6  = 1225
60656  CBCD5B02E6132CD  = 1120
60664  630FDCB02E6162  = 827
60672  E3013500CD3B69CD  = 818
60680  976909FE5B3B5FE52  = 1380
60688  20ECCD3569CDAF6B  = 1198
60696  3E0D73B0D7123CE  = 820
60704  210000C36A87DDCB  = 661
60712  0296CD680DFDCB02  = 935
60720  85ED4B3E712A3271  = 828
60728  23CDCB02562B1C5  = 804
60736  6123011FD02CB  = 712
60744  6311407ID10B00CD  = 815
60752  8569C1CDD0643910  = 1034
60760  DDCB024EC5E5C4AC  = 1298
60768  0EE1C2CD0E69D3E5  = 1201
60776  C5CD480C01E2FDCB  = 1090
60784  02D61B0E112E5E01  = 529
60792  1D0DCBE69CDCB02  = 899
60800  4EC4FC0ECDCE69C9  = 985
60808  78B120237C9AFC5  = 959
60816  E5DDCB0256281CE8  = 1064
60824  110B0011411407106  = 250
60832  DE1AFE5F2803BE20  = 640
60840  D7231310FA1E11803  = 573
60848  E1182813446E010F  = 500
60856  0CCD0C205D4A0108  = 493
60864  0CCD0C203E06D7DE  = 793
60872  1153EE010F00CD0C  = 491
60880  2CD1C10600CD3C20  = 547
60888  3F0DC7F3C15F0E78  = 950
60896  B1370B7E1140015  = 617
60904  3CFE16C218F1D078  = 1068
60912  02EE02D7722C911  = 802
60920  946C012300CD3869  = 741
60928  C0979B3B3FE59C2  = 1055
60936  EC7B3D503B3B0C0  = 1037
60944  8E0FFD2E02661193  = 876
60952  8F01330CCD3C2008  = 456
60960  0F4E2E14E7E4B6  = 829
60968  D33ECD73E0D7E  = 858
60976  11D7FFD7CD541FD  = 1182
60984  CDAFB3EECD3EC0D  = 1389
60992  2E0A2146711AF71  = 539
61000  1FBE20D2A31310F8  = 757
61008  3F5971FE4C2C5411  = 819
61016  C65FC15500CD3C20  = 626
61024  E1A0:1060A18CDE4  = 735
61032  8E2E3E1FE5B3E71  = 905
61040  221B21BF7CCD2B66  = 903
61048  2E2E51115700CD2B66  = 715
61056  CD8E9D0ACD5769  = 877
61064  CD65911CH1247C0  = 835
61072  012A0CC03C2011BA  = 513
61080  71010A0CD3C2011  = 438
61088  7270013400CD3C20  = 574
61096  2E0DC721A171135  = 664
61104  71010E20ED000014  = 56
61112  7210FDCDE8DD2A32  = 1150
61120  71E3E3F1EF5B3871  = 615
61128  A7ED5B2EB1337E3F  = 1112
61136  CD5B0CDF1DA5057  = 1143
61144  CD016000ACDC759  = 745
61152  C31068062A114871  = 533
61160  1ABEC0231312F929  = 928
61168  CD5B0FDCB02E011  = 934
61176  CD6E01E5000C3C20  = 651
61184  0600482148710CD24  = 735
61192  6B0181EF71213871  = 757
61200  010E20ED5B0214871  = 616
61208  0E0AED5B0511F55E  = 1020
61216  0E3HCD0231312F929  = 928
61224  6C0FE5C0804FE4E  = 1040
61232  20F4FD73E5B5B20  = 974
61240  213E4C1213D51110  = 457
61248  6F012200CD3C2008  = 449
61256  0F4B2148710CE435  = 837
61264  D1D501A00A214871  = 664
61272  EDB0062321E7710E  = 914
61280  2E2310FB1113F0E  = 513
61288  E3C3C2C0F97E9C5  = 1005
61296  DDE5DD21EF711E0  = 980
61304  203FFFCD7301DA1  = 1156
61312  0684FB7610FD2A80  = 842
61320  71ED5B3271A7ED52  = 1090
61328  23444DDD5C9EBE5  = 1291
61336  CB2623DB7B120F8  = 832
61344  DDE1D13E7FDDC204  = 1175
61352  DDE1D52E1BF71CB  = 947
61360  0E3C1DFE1E2E6F01  = 542
61368  3130C1C3CD9769  = 807
61376  FE5B2A0F5E1F30  = 959
61384  3F7F6E5E5EDCD7  = 1195
61392  0E3DD7B1D0B7D8  = 850
61400  2321E7711A171A  = 609
61408  BE20E1231310F82A  = 807
61416  3871E3B3271A7ED  = 1064
61424  82DCE3C5DCE1EB13  = 1445
61432  3E7F7FCD5B05DDE1  = 1228
61440  2A3C7E5D2016CE1  = 921
61448  2A3271ED5B3271A7  = 869
61456  ED5244A0C3E6CB0E  = 918
61464  239B7B6120F3CD921  = 957
61472  0500226C1E14B3E  = 898
61480  0208C5ED483271  = 913
61488  0B2A3271ED586D  = 833
61504  7119C5E5EB21400  = 852
61512  19E5EB06031ABEE3  = 754
61520  13381-200210F6C1  = 620
61528  C1EDC.0078B120E2  = 1319
61536  C10B78B120CDC9E1  = 1164
61544  E5ED5B6D71A7ED52  = 1265
61552  11-57.011400ED50  = 636
61560  D7E1E5D5ED4B6D71  = 1410
61568  A7ED42EDA7CE4EEB  = 1410
61576  21.400ED5B2E1D1D5  = 1081
61584  E5EBEDSB6D71A7BD  = 1413
61592  52EB2.48710E14ED  = 806
61600  B0.3B-CDC968D8CD  = 1311
61608  8E6DCD968206CD  = 1069
61616  8E68CD3B68CD0EE9  = 906
61624  C9.19.6C012300CD  = 715
61632  5B6CD9789FE59C0  = 1240
61640  2A3871ED5B3271F7  = 869
61648  ED5244A0ED8223600  = 788
61656  0B78B.20F82A3271  = 793
61664  2322371232237I  = 470
61672  23223871ED433E71  = 717
61680  C33063DDCB024EC8  = 1046
61688  2A3871112000E21  = 320
61696  0CA7ED5230FF7987  = 1052
61704  8787A7F3CDAF0EFB  = 1229
61712  C9CD8569B1B76C01  = 983
61720  2000CD8B59060ACD  = 702
61728  789CDB59E5ED  = 1285
61736  AA89CDB59FECB30  = 1326
61744  DE3E16D7AFD73E03  = 976
61752  D7E1E5B4C10E00CD  = 831
61760  3C203E16D7AFD73E  = 843
61768  0FD70.0800C3C20  = 536
61776  E5EB3E16D73E01D7  = 1041
61784  AF074E2046EC436B  = 984
61792  7123SE23356CSD5CD  = 976
61800  3C20E1C1118F71ED  = 1020
61808  B0E1CED3E17271FD  = 904
61816  B3DE1E1E1E1E1B0  = 867
61824  C911D76C12100CD  = 781
61832  8B69FDCBC2C60608  = 914
61840  4821407ICDE468FD  = 1072
61848  CB0286C9FDCE309E  = 1228
61856  CD9769FDCB30CDED8  = 1403
61864  FE0C230777D72310  = 898
61872  EB47C9789B3E504  = 1181
61880  2E08D73E30D73E08  = 861
61888  C7E8D9C0D8D9C0D8  = 905
61896  D8D8E5C0D8E5C0D8  = 1389
61904  CB0B8E5C5C0E578  = 896
61912  3DC5E5CD4DE5EEE1  = 1334
61920  C10E000CF7EC5230  = 753
61928  FA.00020B78FE01  = 705
61936  2B6DCDCBC2482308  = 690
61944  DDCB0205790E3DD7  = 1226
61952  10E57F1C0F80221  = 1119
61960  0100C8473E0F1100  = 361
61968  00626FC5470E1910  = 982
61976  D9E1CDC1C0F7E5C5  = 1206
61984  EF5E2E2E2E2E2E2E  = 992
61992  E5C1E4D0CDE5D3E1  = 963
62000  C1111E4D0210FDC1  = 784
62008  10E7CDE4C9D0D0CD  = 1107
62016  44ED79FDCD0D0CD  = 1144
62024  3C20FDCB0E09FD  = 1138
62032  CD01AE78FDCE016E  = 1063
62040  20F5CD54.F3FD09C  = 763
62048  3FC9C1C0C6216F71  = 718
62056  3C6D2D0D0CD1E0D7  = 709
62064  C9ED4B5E1178E120  = 1017
62072  03FED1C3E4A3271  = 632
62080  1140711AFE2C1C78  = 657
62088  E50E081AFE2C0823  = 534
62096  1310F8E1C1BFD0E1  = 1010
62104  C1111400190E78B1  = 563
62112  200EFD1C8FDCB30  = 1214
62120  DECD6B0CFDCE0288  = 1139
62128  116E6C21250CCD3C  = 539
62136  2D6DDC2E7F1C03E  = 677
62144  0200DCD5C1E3D9E  = 634
62152  5E0D9E3C3FE3A2  = 1210
62160  2E6BFE0BCA0468FE  = 992
62168  03CACE8AFE0E2869  = 930
62176  FE07CA8FFFFCCB  = 1129
62184  426BFE0C28CFE05  = 772
62192  20EBF07E30EE03FD  = 1001
62200  7720211787E2605  = 643
62208  FE7020023EEC0E0  = 573
62216  772810FC1AFF0D7F  = 982
62224  01FE0023C8FDCB30  = 807
```

(continued on page 104)

SPECT

Jon Ellis with a data handler that does away with arrays.

SECURIFILE IS A flexible machine-code data-handling program which illustrates the best of the different approaches to data storage.

Broadly speaking, most database programs for the Spectrum can be divided into three categories according to flexibility.

The first category are those programs designed for specific data, and require modification before the data can be altered. An example is a program I wrote to test all of our computer games and information about them such as their controls. The information was held in data lines, and was read as required.

When a new game needed to be added, the program had to be loaded, altered and then resaved. To alter the program so that it could store data on a subject such as a book collection, a major rewrite would be necessary. To a user who knew nothing about programming, the program would merely provide a fixed set of information with no scope of change.

The second category consists of programs which declare a large array at the beginning, and you input data into the elements of that array. These elements can then be sorted, listed, printed etc. The whole array can be saved on tape and reloaded when required. These programs have the major advantage in that data on any subject can be stored and handled. This means that two users can use the same program skeleton to handle wildly different sets of data.

There are, however, several major disadvantages of this approach: the form of each item is dictated at the beginning of the program by the dimensions of the array; the programs are often written in Basic and their sort routines are therefore slow; there is little scope for cross-referencing etc. When such programs are implemented on the Spectrum, another major disadvantage appears — they waste a lot of space. This is due to the way that the Spectrum handles both string and number arrays.

If there are any unused elements in an array then the Spectrum will fill these with either spaces or zeros as applicable.

This means that if one piece of data is significantly longer than the rest, the array will have to be dimensioned for the longest item, and so space will be wasted at the end of the other items. This bulking out is known as Procrustean assignment and is a prime example of fixed length record storage.

The programs in the third category do away with arrays and their accompanying disadvantages and use a variable length record system. This means that only the data is stored and little space is wasted. These programs are the most flexible, imposing few constraints on the data to be stored. These programs are, however, difficult to write, especially in Basic.

To design a database system we should look at the features we would like it to have. Some of the factors to be taken into consideration are:

Bearing in mind all these points, I developed Securifile.

Securifile would be included in category three. It uses a variable-length record storage technique to provide many facilities in a memory-efficient fashion.

Securifile is a reasonably large program as far as typing in goes, 4040 bytes of machine code and data, starting from 25000. This leaves only 2925 bytes available for data on a 16K Spectrum, but a massive 35693 bytes are free on a 48K Spectrum. You need a 48K Spectrum to enter Securifile from the listings, but tape copies will run quite happily on the 16K machine. Tape copies of Securifile are available from the author at 29 Ashridge Drive, Bricket Wood, St. Albans, Hertfortshire, AL2 3SR for £3.75.

To enter Securifile from the listing, you should type in and run listing 1. This will prompt you for the bytes from listing 2 which you should enter in the rows, entering the checksum when prompted. The checksum should catch most typing errors. When finished the program will save the object code onto tape. Type New and then enter and run listing 3. This will relocate the code down to 25000.

Type New and enter listing 4. Place a blank tape into the recorder and type

SAVE "SECURI-FILE" LINE 10

This program should be verified. Now type

SAVE "SECUR CODE" CODE 25000,4040

and then verify the code block also. Now type

RANDOMIZE USR 25000

and the menu should appear on the screen.

Once you have got a working copy of Securifile you should load it up and then read through this section carefully, trying out any points that you do not follow on the program.

Securifile offers 14 functions from a menu, each of which being accessed by pressing the key indicated in red on the menu. Before going on to the detailed breakdown of each function, some explanation of various features of the program is necessary. These features are not actually functions, merely subroutines which are used by several functions.

The screen editor: This is a major routine used by the add item and change item functions to allow you to input an item to the file. The editor presents you with a screen and a cursor which may be moved around using the keys 5, 6, 7 and 8 with Caps Shift. At the top of the screen there is a space for you to put the key field — KF — of your item, and also a space for the tag field — TF. To move the cursor up to the top line, you will have to place it below one of these spaces and then press up.

Caps Shift 2 will change the state of the Caps Lock, indicated by the bar in the top right corner — green = Caps Lock on, blue = off. Caps Shift 1 will wipe the screen, giving you a blank page. This function is queried. To place a character at the current cursor position, just type the appropriate character. To delete a character, move the cursor to the offending character and type a space over the top. Characters such as [which were previously obtained using extended mode, are now available using symbol shift and the appropriate key — © is symbol shift Q.

The following characters should not be used in either the key field or the tag field, although they may be used freely within the item itself: ©, [,], {, }, \, —.

Querying: Drastic instructions are queried by the message "Are you sure? Y/N". Only if you press Y will the instruction be executed, any other key results in the instruction being disregarded.

RUM SECURIFILE

- Memory consumption. The program should be as small as possible, maximising space available for the data, which itself should be stored as efficiently as possible.
- As few constraints on the makeup of the file as is possible. The database should be able to handle items of different formats within the same file.
- The program should offer the following basic functions:
  i) The ability to append an item to the file.
  ii) The ability to delete an item from the file.
  iii) The ability to edit an item.
  iv) The ability to store the file on some backup storage — tape, Microdrive
  v) The ability to list the items.
  vi) The ability to sort into alphabetical order.
- A more advanced database program might also provide some extra features such as cross-referencing between items, printer compatibility, a choice of storage media, sublist extraction, file security, network communications using the ZX Net.

Program 1.

```
  5 CLEAR 59999
 10 DEF FN h(h$ =16*(CODE h$(1)
-48-(7 AND h$(1) >"9"))+CODE h$(2
)-48-(7 AND h$(2) >"9"))
 20 INPUT "Start ";s
 30 INPUT "Finish ";f
 40 FOR n=s TO f STEP 8
 50 LET tot=0: PRINT n;" ";
 60 INPUT h$: PRINT h$;
 70 LET x=0
 80 FOR b=1 TO LEN h$ STEP 2
 90 LET z=FN h(h$): LET tot=tot
+z
 100 POKE n+x,z
 110 LET h$=h$(3 TO ): LET x=x+1
 120 NEXT b
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN PRINT "input
error - try again": GO TO 50
 150 NEXT n
 160 SAVE "SEC OBJ 1"CODE 50000,
4040
```

Program 3.

```
 50 CLEAR 24999
 60 FOR F=40000 TO 40011
 70 READ A: POKE F,A
 80 NEXT F
 90 RANDOMIZE USR 40000
 100 DATA 1,200,15,17,168,97,33
98,234,237,176,201
```

Program 4.

```
 50 POKE 23693,71: BORDER 0: CL
EAR 24999
 60 PRINT AT 11,5; INK 0; PAPER
6;"SECURIFILE is loading"
 70 LOAD "SECUR CODE"CODE 25000
 80 RANDOMIZE USR 25000
```

Input of keyfields etc: There will be many times when Securifile wants a piece of information such as the key field of an item to be deleted, or the filename for a cassette save. At these times you will be prompted to enter the information. The characters that you type will be printed on the screen.

All of this input is in lower case, to obtain capitals you will have to use the Caps Shift key as on a typewriter, there is no Caps Lock. You may use delete — Caps 0 — to correct a mistake. Any spare places should be bulked out with spaces.

Break can be pressed at almost any time, and it will abort the function, returning you to the menu. However, Break should not be pressed while a tape function is in operation,

(continued on next page)

(continued from previous page)

indicated by the flashing blue/red border or the blue/yellow lines. This could result in the corruption of your file.

The report "Tape recovery error" which may occur during the load, save and header reading functions is slightly ambiguous. It may mean either of two things: the program is expecting a header block and has read some other tape block by mistake, or that there has been a genuine tape error.

The menu gives the following functions:

1) Add an item. When you select this function you are presented with a blank screen and the cursor of the screen editor. When you have finished making up your item you should move the cursor to the last character and press Enter. If the key field of the new item is already that of an existing item then the program will present you with a choice of changing the new item's key field — press C — or deleting the old item — Press D.

2) Change an item. Apart from the fact that this function will prompt for a key field, and will then display that item, this is the same as the add item function in operation.

3) Delete an item. This function prompts for a key field of an item, and will delete it from the file if it exists.

4) Extract sublist. This is possibly the most powerful function of Securifile. When you select this function it will prompt for the tag field pattern that quality an item for being part of the sublist. This is best explained by means of an example:

Suppose that your file consists of a mixture of bills for the past three years. The bills are for electricity, gas and water. You have decided that the first character of the tag field on any item will be either E, G or W — depending on the subject of the bill — the second and third characters will indicate the month of receipt of the bill — e.g. May = 05, November = 11 — and the fourth and fifth characters will denote the year e.g. 84. The remaining three characters will be undefined. Now, using this function you could ask for a list of all gas bills by using the search pattern G_____. The _ character indicates that that particular character in the pattern is not significant.

To extract a list of all bills in June, the pattern would be _06_____. All bills in June 1984 would require the pattern _0684_____. Note that the pattern of eight _ characters is the equivalent of listing all items. When either the screen is full, or the list is complete, the program will wait for you to press X before continuing.

5) Header catalogue. For security Securifile stores its files on tape using a non-standard format, which is however, quite similar to that used for saving programs on tape — a short header block containing the program filename, followed by a block containing the program proper. This function will read the header blocks created by the Securifile save routine.

It will print the filename of that file on tape, this being the name you must quote in order to load that file, and may also print Locked underneath the filename. This indicates that the password security option is locking that file, and that you will need to know the correct password in order to load the file.

6) Key field sort. This function sorts the list of key fields into alphabetical order.

7) List items. This function lists the key field and tag field of every item in the file, pausing after each screen for you to inspect the list. Press X to continue listing.

8) Printer toggle. This function toggles the printer option between On and Off. If the printer toggle is On then output from the following functions is also dumped to the ZX Printer: Extract sublist, List items, View items.

9) Quit. This function is queried before Securifile and control is returned non-destructively to Basic.

10) Recover file from tape. This option allows you to reload a previously saved file from tape. It will prompt for the 10-character filename that the file was saved under. You should use the header catalogue function to find the exact filename if you cannot remember it. The specified header will then be loaded.

If the file is locked you will have to stop the tape and enter the correct 10-letter password before the program will load the rest of the file. Unprotected files will load straight through without stopping.

11) Save file onto tape. This option allows the current file to be saved on tape. It prompts for a 10-character filename under which the file is to be saved. The program then asks if you want to restrict access to the file. If you press "Y" then you will be prompted for a 10-character password which will secure that file. When you have entered this, or if you choose to have an unprotected file, the program will display the message "Ready tape & press any key".

You should set up the recorder and start the tape recording before pressing a key. The file saves in two bursts with about a two second gap between them. The file is saved in a coded form. After saving the program will ask you to rewind the tape and press V when ready, the file will then be verified. A successful verification is indicated by a return to the menu. An unsuccessful verification will display the message "Tape recovery error". Rewind and try again.

12) Tag field sort. This function sorts the items in the file into alphabetical order by their tag fields.

13) View item. This option will prompt for the key field of the item to be displayed, and will show the whole item on the screen if it exists.

14) Wipe file. This option is queried and if executed will wipe the current file, returning the internal pointers to their original positions. ■

(continued from page 102)

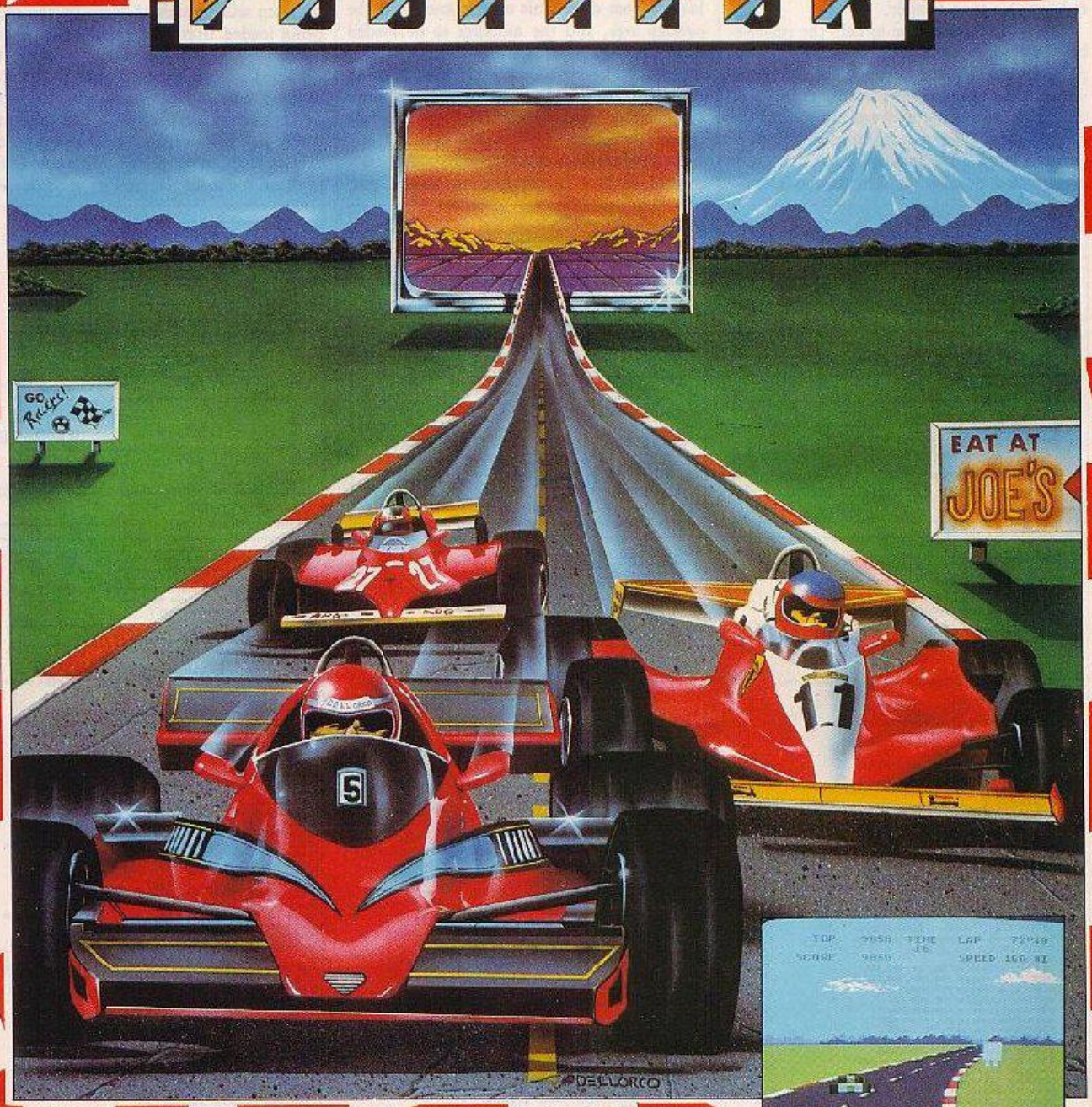
```
62232: DEC0956B092F270 = 1271
62240: 010B00ED81200921 = 520
62248: FD70097EFE002899 = 947
62256: FE2038955F5E1D57 = 885
62264: DD7E01DD7E00C7 = 1125
62272: 7BD7CD956B2C02EB = 1241
62280: 73CD956B0C7E01FE = 1175
62288: 002820DD7E00FE1F = 704
62296: 28CDD3490182 1CD = 596
62304: 360000DD0401DD7E = 875
62312: 01FE162013DD3501 = 604
62320: 01180DDD7E00FECA = 649
62328: 38E02804FE1638DA = 874
62336: CD956B0C7B6CD95 = 1133
62344: 6BDD7E01FE002818 = 776
62352: DD7E00FE002805DD = 867
62360: 350018FE0D3600 1F = 611
62368: DD350120CBDD3601 = 802
62376: 1510DDDD7E00FE10 = 676
62384: 30E5FE0F28C7FE04 = 1045
62392: 38C618DBCD956BDD = 1179
62400: 7E01FE0028BFDD35 = 881
62408: 0120EBDD3401DD7E = 835
62416: 00FE1730FDFE0F30 = 813
62424: 08FE0E30F3FE0338 = 797
62432: 9FDD3501189FCD9E = 965
62440: 6BDD7E01CDD77D1 = 855
62448: FE1538CDD3E01D1 = 749
62456: 1806CD0E2D0CE00E = 743
62464: 16D7DD7E21D7DD7E = 1117
62472: 00D73E2007CD9588 = 985
62480: C0CE6F11946C0123 = 815
62488: 00CD8869FDCB30DE = 1175
62496: CD976CFDCB309CFE = 1377
62504: 592806CD8569C311 = 790
62512: 6ACDAA63CDED69C3 = 1328
62520: 02E42A6871D6C26 = 583
62528: 0044292929292909 = 263
62536: 01FF710E09E1ED7 = 724
62544: DD7E01D7DD7E00D7 = 1125
62552: 3E15D73E01D73E5F = 733
62560: D7CE15D7AFD7C9FD = 1357
62568: 36E2FFDDE501FE7F = 1223
62576: 3F01FD7906147612 = 881
62584: FDDD21A171112300 = 833
62592: 3EFF37CD5605DDE1 = 1114
62600: 30F0E321A171CB = 646
62608: 0E2310FB11976E01 = 595
62616: 0D00CD01F011AF72 = 616
62624: 010A00CD3C201AFE = 588
62632: 4C200C3E0DD7010E = 425
62640: 0011A46ECD3C20A7 = 755
62648: C9011800118B26ED = 739
62656: 3C200C7C9160003 = 397
62664: 01120110024B4559 = 271
62672: 204649454C442049 = 493
62680: 4E2585345203A16 = 459
62688: 010213001200100 = 56
62696: 2743272D4368616E = 568
62704: 6765206E6877 2020 = 542
62712: 2743272D4572617 3 = 587
62720: 65206F6C54160003 = 477
62728: 1001120110024E6F = 346
62736: 742065E6F758758 = 794
62744: 20726F6F2020665F = 722
62752: 72206974556D1600 = 599
62760: 001301110648463A = 246
62768: 160000544463A1600 = 268
62776: 17110410007F204A = 293
62784: 2E456C6C69731107 = 375
62792: 1300100016000513 = 31
62800: C1120110024172665 = 318
62808: 20796F752073752 = 759
62816: E5203F2020592F4E = 182
62824: 2010001200130016 = 116
62832: 000710012001002 = 64
62840: 4E6F20737563626 20 = 588
62848: E86579206869656C = 777
62856: E413001200100216 = 175
62864: 000130146E7465 = 416
62872: 72206869/6EDbb9 = 727
62880: 656C64206F662269 = 691
62888: 74656D3A16010213 = 438
62896: 2010010A11031301 = 73
62904: 100753454355545 = 482
62912: 4649445510001107 = 828
62920: 1300100301161164 = 512
62928: 20597465501601 03 = 492
62936: 4368616E7562 2069 = 719
62944: 74656D16050321 55 = 525
62952: 6C6374206 20697465 = 760
62960: 6D16060345737472 = 559
62968: 616374207375626C = 782
62976: 697374 1507031365 = 541
62984: 616465722063617 4 = 756
62992: 616C6F72 2020 2020 = 667
63000: 034B557 32D5669 65 = 853
63008: 6C6420736F72742 = 715
63016: 0903406973742069 = 561
63024: 74656D73162A0350 = 555
63032: 72 6D3E746E722074 = 900
63040: 6F6 7376 2620 6E6F = 779
63048: 77163B03517569 74 = 574
63056: 160C03 2 6553 6F76 = 548
63064: 6572206565 3C6520 = 695
63072: 6C72 6F3374 6170 = 790
63080: 6516D0353317 6E = 538
63088: 206639 6 2552074 6F = 707
63096: 207431 7085180E03 = 497
63104: 5461572 6 6 5 9656C = 745
63112: 6A20736 7271162F = 629
63120: 03 6 5 9 6 3 7 7 2 6 9 7 4 = 667
63128: 656D16120357 6970 = 585
63136: 652066 9 6C651511 = 528
63144: 0F130148726556520 = 483
63152: 6D656D6F72793416 = 745
63160: 120F4E6F206F6620 = 400
63168: 6974656D733A1614 = 646
63176: 00100.1300763226 = 261
63184: 31207F20-A6F6E20 = 567
63192: 456C6C6973203139 = 643
63200: 3A3A1000 1 6000011 = 172
63208: 04 3 0 4 0 4 0 4 9 5 3 5 4 2 0 = 372
63216: 43-F4D6D-2455445 = 602
63224: 110713000 1 0201301 = 82
63232: 10074B463A110713 = 289
63240: 00 2000110 3 3 3 2 1 2 = 72
63248: 0754463A 1071300 = 282
63256: 1000160006100150 = 141
63264: 726573732025822 = 633
63272: 20746F2065736361 = 703
63280: 7065 1610 4507225 = 535
63288: 7373202222222074 = 560
63296: 6F20726561642068 = 591
63304: 65616 5 6 5 7 1 1 0 0 2 1 0 = 545
63312: 0146696C6 5 6 5 6 1 6D = 701
63320: 6 5 7 0 1 0 0 0 1 3 0 1 1 0 2 2 = 215
63328: 4 6 6 F 6 5 6 8 6 5 6 4 1 3 0 0 = 613
63336: 1000130110025461 = 235
63344: 7065207265 6 0 6 F 7 6 = 788
63352: 6572792065727 2 6F = 808
63360: 7213001000160300 = 174
63368: 456E74657522 6 6 6 9 = 749
63376: 6 0 6 5 6 6 1 6 0 6 5 6 2 0 6 6 = 750
63384: 6F7220646174 6120 = 699
63392: 6 2 6 C 6 F 6 3 6 8 3 F 0 D 1 0 = 610
63400: 0213011600210000 = 67
63408: 1300526573747269 = 652
63416: 6374206163636573 = 758
63424: 7320746F206666 9 6C = 721
63432: 65203F2028592F4E = 482
63440: 2910013011160000 = 113
63448: 1000100045 6 E/465 = 431
63456: 7220616365657373 = 772
63464: 207065173737376F72 = 615
63472: 642A0C100C130116 = 231
63480: 0F0214213005265 = 234
63488: 5164732047 6 1/4b2 = 775
63496: 206820707265737 3 = 653
63504: 20616E79206B5879 = 721
63512: 1002161223100213 = 96
63520: 0122667 7 6 9 6 8 6 4 2 0 = 652
63528: 746170 6 5 6 1 6 5 6 4 = 777
63536: 207072657373202 2 = 655
63544: 562218130874 6F20 = 431
63552: 5645524946 5 5 1300 = 483
63560: 1000001600301001 = 71
63568: 4 6 6 E 7 4 0 7 2 8 2 0 0 0 9 = 748
63576: 6C656F1306 5 20 6F = 789
63584: 6620644174612052 = 674
63592: 206F6368 2 0746F20 = 716
63600: 6285206C2F616 65 = 748
63608: 6 4 3 A 1 3 0 1 1 0 0 2 1 7 0 9 = 228
63616: 0013011201130050 = 141
63624: 544F502054 6 4 5 2 0 = 502
63632: 5441504510001300 = 333
63640: 120000D0054 6 6 6 9 7 3 = 452
63648: 206669 6 0 6 5 2 0 6 9 7 3 = 700
63656: 2070617373776F72 = 610
63664: 6120606F636B6564 = 750
63672: 250D100146 6 F 7 4 6 5 = 472
63680: 7220746 3 6 5 2 0 7 6 1 = 700
63688: 737377 6 F 7 2 6 4 3 1 1 3 = 752
63696: 0112001600031301 = 62
63704: 1002120.4 9 4 E 4 5 4 F = 304
63712: 5252454354205041 = 561
63720: 5353574F 5 2 4 4 2 0 7 4 = 643
63728: 7279206167616 9 6 E = 779
63736: 1200113001001100 = 73
63744: 0606170020 4 F 7 6 6 5 = 365
63752: 7272696 4 6 5 2 0 6 F 7 2 = 789
63760: 6572617465642070 = 785
63768: 6173737 5 7 5 7 2 6 4 2 0 = 601
63776: 5473320D1300 1 1 = 227
63784: 13000D0D50617373 = 452
63792: 775F726420616363 = 771
63800: 6570746564 2 D0 0 1 7 = 611
63808: 0900120.11061301 = 71
63816: 5354.15 2 5 4 2 0 5 4 4 8 = 986
63824: 4520544.50451107 = 423
63832: 1200130016000213 = 78
63840: 0.4 5 6 E 7 4 6 5 7 2 2 0 7 4 = 659
63848: 6 7 6 7 6 6 9 6 5 6 C 6 4 2 0 = 748
63856: 6 6 F 6 2 0 7 3 6 5 6 4 7 2 = 758
63864: 6 3 6 2 E E 5 7 3 6 5 2 0 5 F = 677
63872: 20666F7220 E6F74 = 723
63880: 20696D705F727461 = 756
63888: 6E740A1001130016 = 342
63896: 0100536561726368 = 599
63904: 695E6720666F723A = 735
63912: 1001A0C0C0C6C0C6 = 1178
63920: C9C8C0CDE27E5C7B = 1380
63928: 7D00007F5 8 E D7C00 = 560
63936: 4143444454045450 = 572
63944: 5152535455657585 2 = 664
63952: 5163616310E43F64 = 667
63960: 6864 5 E6436E93F65 = 733
63968: 5765386667 7 E867 = 890
63976: 01688F7490749174 = 865
63984: 92740100012000000 = 264
63992: 3102303435363738 = 420
64000: 3102303435363738 = 420
64008: 3930303938373635 = 428
64016: 3403323155565557 = 555
64024: 4152424547 5 2 0 0 0 0 = 463
64032: 01000000 = 1
```

Experience the thrill of Formula One Motor Racing

ATARI

POLE POSITION®

64



This genuine reproduction of one of the worlds most popular arcade classics gives you the chance to experience the thrill of Formula One motor racing! Enter the practice sessions. Race against the clock to qualify. Dice with other drivers for the lead. Only your skill and endurance see you to the chequered flag first!

CASSETTE £9·95 DISK £12·95

U.S. GOLD All American Software

Premier Arcades™ from Datasoft®

DISC OVERLAYS

P Andrews squeezes more into the BBC.

THE BBC COMPUTER is a sophisticated machine with many facilities including an excellent Basic interpreter which sets it apart from most other home computers. The main limitation of the machine is the restriction of having only 32K of Ram. Cassette-based machines have about 27K bytes available to Basic when using Mode 7, but disc-based machines have only 25K because the Disc Filing System — DFS — claims about 2.75K for workspace. Using any other screen mode reduces this even further.

Very little can be done to help the cassette-based owner, but it is possible for a BBC computer with disc drive to run a Basic program whose size is limited only by the capacity of the floppy disc being used and the skill of the programmer. The way to achieve this apparently impossible task is to split the program into a number of separate modules — which every programmer should do anyway — and store them on a floppy disc.

The separate modules are only loaded into memory when required and so the modules not being used do not occupy any store Ram. An area of Ram is set aside for the program modules to occupy when they are called and loaded from disc. This area is known as the overlay area, and the modules to be loaded from disc to this area are known as overlay modules. The term overlay is used because when a module is called it is "overlaid" onto the overlay area overwriting any module previously called.

Because modules will overwrite each other a control section is required to ensure that overlay modules are loaded whenever they are required. A routine called the overlay handler is used to control the loading of overlay modules.

As well as the overlay handler a section of code will always be present in Ram. This constitutes the main program and will contain the main body of the program and any routines which are frequently called. It is unwise — unless absolutely necessary — to put frequently called routines into an overlay since the program will be slowed down by the routine being loaded from disc many times over.

Figure 1 shows the memory map for a typical Basic program. Figure 2 shows the memory map for an overlaid Basic program. Since Lomem indicates to the interpreter where all identifiers are to be stored then the overlay area can be created by moving Lomem to make room for the overlay modules to be

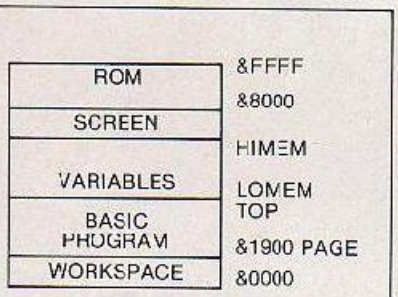
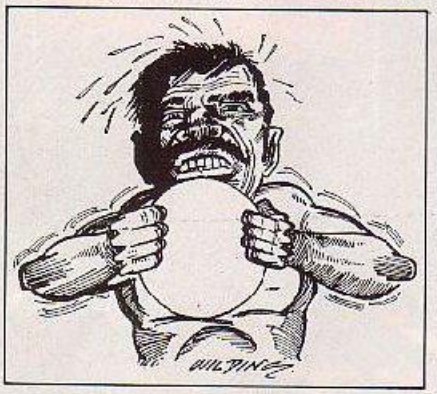


Figure 1. Memory map for a typical Basic program.



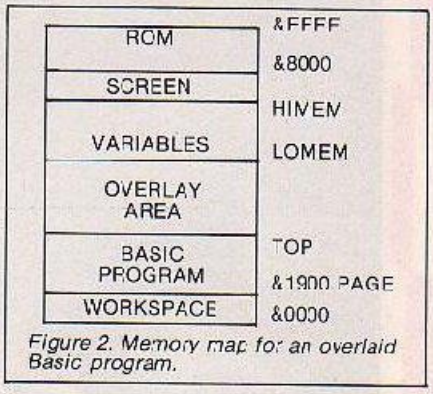


Figure 2. Memory map for an overlaid Basic program.

Listing 1.

```
10REM BBC Overlay Handler Demonstration
20REM by P. Andrews April 1984.
30IF PAGE>&1900 THEN PAGE=&1900:CHAIN"ROOT"
40ON ERROR MODE 7:REPORT:PRINT " AT ";ERL:END
50*OPT 1,0
60:
70REM set up size of overlay area.
80:
90LX=1200
100:
110REM set up pointer to start of overlay area.
120:
130OV=LOMEM-2
140:
150REM reserve space for overlay area.
160:
170LOMEM=LOMEM+LX
180:
190PROCinitialise_overlay_handler
200:
210MODE 4
220:
230PROCscreen_display
240:
250PROCwindow(0,31,39,26,0,3,TRUE
260:
270PROCroot_routine
280:
290PRINT #110$
300VDU7:PRINT "--End of demonstration--"
310PRINT "Use CHAIN not RUN to try again!."
320STOP
330:
340REM==========================
350REM Root Procedure Definitions.
360REM--------------------------
370DEF PROCscreen_display
380VDU 19,0,4;0;
390PROCrectangle(750,300,800,350)
400PROCrectangle(750,600,300,700)
410PROCrectangle(750,300,1,700)
420PROCrectangle(100,600,250,1)
430PROCrectangle(400,600,250,1)
440PROCrectangle(32,495,1,480)
450PROCrectangle(0,975,1,680)
460PROCellipse(0,-P.250,680)
470PROCellipse(P.,W,250,850)
480PRINT TAB(0,0)"Max overlay nest"
490PRINT TAB(18,0)"0"
500PRINT TAB(24,2);"Variables"
510PRINT TAB(26,18)"Root"
520PRINT TAB(35,12)"ON"
530PRINT TAB(35,11)"&";~TOP
540PRINT TAB(35,20)"&";~PAGE
550PRINT TAB(35,21)"PAGE"
560PRINT TAB(35,1)"&";~LOMEM
570PRINT TAB(35,2)"LOMEM"
580PRINT TAB(1,15)"Overlay nesting"
590PRINT TAB(5,5)"Disc"
600PRINT TAB(4,8)"OVER1";TAB(4,10)"OVER2"
610:1$=CHR$(17 +CHR$(1)+CHR$(17)+CHR$(128)
620:0$=CHR$(17 +CHR$(0)+CHR$(17)+CHR$(128)
630ENDPROC
640REM--------------------------
650DEFPROCellipse(start,end,x,y)
660LOCAL step,angle
670MOVE x+150,y
680step=(end-start)/30
690FOR angle=start TO end STEP step
700DRAW x+150*COS(angle),y+45*SIN(angle)
710NEXT
720ENDPROC
730REM==========================
740DEFPROCrectangle(x,y,height,width)
750MOVE x,y
760DRAW x+width,y
770DRAW x+width,y+height
780DRAW x,y+height
790DRAW x,y
800ENDPROC
810REM==========================
820DEFPROCnovestring(x1,x2,y,s$)
830LOCAL x,step
840PROCwindow(x2-1,19,x2+7,6,1,0,TRUE)
850:i=x1*32:s2=x2*32:y=1003 y.32
860VDU5
870GCOL 0,1
880MOVE x1,y:PRINT s$
890FOR x=x1 TO x2-32 STEP 32
900:TIME=0:REPEAT UNTIL TIME>5
910GCOL 3,1
920MOVE x,y
930PRINT s$:MOVE x+32,y:GCOL 0,1:PRINT s$
940NEXT
950MOVE x1,y:PRINT s$
960PROCrectangle(400,600,250,1)
970PROCrectangle(750,300,800,350)
980GCOL 0,1
990VDU4
1000ENDPROC
1010REM--------------------------
1020DEF PROCroot_routine
1030LOCAL reply$,overlay_number
1040PRINT '"Root ";:ON$
1050REPEAT
1060REPEAT
1070PRINT "Type :-"
1080PRINT "RETURN to exit this demonstration, or'
1090PRINT "1A,1B or 2A to enter another routine"
1100:NPUT reply$
1110UNTIL reply$="1A" OR reply$="1B" OR reply$="2A" O
R reply$=""
1120IF reply$="" THEN 1170
1130overlay_number=EVAL(MID$(reply$,1,1))
1140PROCp("routine"+reply$-"!"!"ROOT"")",overlay_numbe
r)
1150PRINT (1$+" Root ";r$+;
1160PRINT " return from overlay call"
1170UNTIL rep.y$=""
1180ENDPROC
1190REM==========================
1200DEFPROCwindow(x1,y1,x2,y2,f,b,s,clear_flag)
1210VDU 28,x1,y1,x2,y2
1220COLOUR f
1230COLOUR b+128
1240IF clear_flag THEN CLS
1250ENDPROC
1260REM==========================
1270REM Overlay handler routines
1280REM==========================
1290DEFPROCinitialise_overlay_handler
1300max_nest=8:root=255:this_ov=255:max_depth=0
1310DIM oscstr 15,ov_name: max_nest
1320ov_idx=0:ov_next?0=root
1330ENDPROC
1340REM==========================
1350DEFFNom(str$,ov_call$,ov_no)
1360REM routine to load overlay.
1370LOCAL ret,ret$
1380IF ov_idx>=max_nest THEN VDU 7,7,7:GOTO 1610
1390IF ov_no<0 OR ov_no>255 THEN PRINT "Illega. overl
ay":STOP
1400ov_idx=ov_idx+1
1410IF ov_idx>max_depth THEN max_depth=ov_idx
1420PROCwindow(18,0,19,0,1,0,TRUE)
1430PRINT ;max_depth;
1440ov_next?ov_idx=ov_no
1450IF this_ov=ov_no THEN 1500
1460REM the overlay must be loaded into store.
1470PROCnovestring(4,25,6+2*ov_no,"OVER"+STR$(ov_no))
1480PROCosc_command("LOAD over"+STR$(ov_no)+" "+STR$~
(CX))
1490this_ov=ov_no
1500PROCwindow(1,26,22,16,1,0,FALSE)
1510PRINT ;ov_idx;ov_call$
1520PROCwindow(0,31,39,26,0,1,TRUE)
1530IF str% THEN ret$=EVAL("FN"+ov_call$) ELSE ret=EV
AL("FN"+ov_call$)
1540PROCwindow(1,26,22,16+ov_idx,1,0,TRUE)
1550ov_idx=ov_idx-1
1560REM need to load overlay?
1570IF ov_next?ov_idx=this_ov THEN 1630
1580this_ov=ov_next?(ov_idx)
1590IF this_ov=root THEN this_ov=ov_next?(ov_idx+1):G
OTO1630:REM return to root.
1600REM need to load previous overlay.
1610PROCnovestring(4,25,6+2*this_ov,"OVER"+STR$(this_
ov))
1620PROCosc_command("LOAD over"+STR$(this_ov)+" "+STR
$~(CX))
1630PROCwindow(0,31,39,26,0,1,TRUE)
1640IF str% THEN ret$=r$ ELSE ret
1650REM==========================
1660DEFFNo(ov_call$,ov_no)
1670=FNom(FALSE,ov_call$,ov_no)
1680REM==========================
1690DEFFNSo ov_call$,ov_no)
1700=FNom(TRUE,ov_ca.l$,ov_no)
1710REM==========================
1720DEFPROCc(ov_call$,ov_no)
1730LOCAL t
1740t=FNom(FALSE,ov_call$,ov_no)
1750ENDPROC
1760REM==========================
1770DEFPROCosc_command(command$)
1780REM Proc. to achieve *LOAD
1790osscstr = command$
1800X%=osscstr MOD 256
1810Y%=osscstr DIV 256
1820CALL &FFF7
1830ENDPROC
1840REM====End of Root----------
```

loaded from disc. Although the overlay scheme can save the space occupied by a Basic program it cannot easily be used to save the space used by variables.

Each overlay module may contain several separate routines. To use any of the routines the overlay module in which they are contained must be present in store. If the module must be continually loaded this will be slow; conversely if already loaded then access will be fast. The program will run faster if those routines which are called in sequence are put into the same module wherever possible.

In BBC Basic two types of overlay routine are possible — functions and procedures. The overlay handler must intercept function and procedure calls to overlay routines in order to ensure that the correct module is loaded. Also the handler must know which overlay module contains the routine being called.

To ensure that the modules are loaded correctly all overlay routines must be accessed via the overlay handler. The handler calls the routines once loaded by using the Eval function. To make this possible the call to an overlay routine is made by calling the handler with a string as a parameter containing a call to the routine. A second parameter gives the number of the module within which the routine is stored. Overlay modules are numbered sequentially starting from one and are kept on disc as a series of Basic files Over1, Over2 and so on.

Three separate routines are provided to allow overlay routines to be called. Each routine ensures that the correct overlay module is present in store before the overlay routine is actually called. The string parameter containing the routine call need not normally contain the FN or Proc keywords.

For procedures use: PROCo ("the text of procedure call" overlay module number). For example:

PROCo ("initialise routine", 1)

For numerical functions use FNo ("text of function call", overlay module number). For example:

LET sum = FNo ("difference(a – 6)",2)

For string functions use FNs ("text of function call", overlay module number). For example:

LET x$ = x$ + FNs ("string function (" "BBC" ")",2)

Because the handler calls the overlay routines using Eval it is not possible to code procedures in the normal way. Where an overlay routine is used as a procedure then "Def Proc" should be replaced by "Def FN" and "Endproc" should be replaced by "=0".

Any parameters can be passed to the overlay routines but care is required for string constants. Because a string constant uses quotes any string parameter passed to the overlay routine must have the quote characters put in pairs otherwise they will be taken as being the end of the string. For example a string function normally called using 'FNroutine("string")' when not using overlays might be called using the overlay manager as 'FNSo("routine(" "string" "")",1'.

Most overlay routine calls involve only a single function and so rather than supply the "FN" keyword as the first characters in the parameter string the overlay manager will insert these before calling the Eval function. This saves two bytes per call. If a second function is to be called at the same time then the FN keywords must be added to the function name. If the function is overlaid a nested call to the overlay handler is necessary. For example function funa exists in overlay 1 and function funb exists in overlay 2; func and fund are in the Root. An overlaid function call with both functions could be made with:

10 LET x = func + FNo("funa + 2*FNo (" "funb" ",2) + FNfund",1)

Listing 1 contains a demonstration root and overlay handler. Listings 2 and 3 contain the code for overlay modules 1 and 2. Type in each listing and save each program as "Root", "Over1" and "Over2" repsectively. The demonstration shows on the screen the loading of overlay modules from disc and the nested calls being processed. To run the demonstration type Chain "Root".

Examine the demonstration listing. When you are familiar with its operation you can use listing 4 which is the overlay handler to be incorporated in your own programs. The handler in the demonstration should not be

(continued on next page)

Listing 2.

```
5000REM--------------------
5010REM Overlay area 1.
5020REM  -routine1A
5030REM  -routine1B
5040REM--------------------
5050DEF FNroutine1A(s$)
5060LOCAL reply$, overlay_number
5070PRINT 'f1b0$;" 1A ";f0b1$;" called from ";f1b0$;s
$;f0b1$
5080REPEAT
5090REPEAT
5100PRINT "Type :-"
5110PRINT "RETURN to exit this overlay routine, or"
5120PRINT "1A,1B or 2A to enter another routine"
5130INPUT reply$
5140UNTIL reply$="1A" OR reply$="1B" OR reply$="2A" O
R reply$=""
5150IF reply$="" THEN 5190
5160overlay_number=EVAL(MID$(reply$,1,1))
5170PROCo("routine"+reply$+"(""routine1A"")",overlay_
number)
5180PRINT f1b0$;" 1A ";f0b1$;" return from overlay ca
ll"
5190UNTIL reply$=""
5200REM exit from overlay routine
5210=0
5220REM--------------------
5230DEF FNroutine1B(s$)
5240LOCAL reply$, overlay_number
5250PRINT f1b0$;" 1B ";f0b1$;" called from ";f1b0$;s
$;f0b1$
5260REPEAT
5270REPEAT
5280PRINT "Type :-"
5290PRINT "RETURN to exit this overlay routine, or"
5300PRINT "1A,1B or 2A to enter another routine"
5310INPUT reply$
5320UNTIL reply$="1A" OR reply$="1B" OR reply$="2A" O
R reply$=""
5330IF reply$="" THEN 5370
5340overlay_number=EVAL(MID$(reply$,1,1))
5350PROCo("routine"+reply$+"(""routine1B"")",overlay_
number)
5360PRINT f1b0$;" 1B ";f0b1$;" return from overlay ca
ll"
5370UNTIL reply$=""
5380REM exit from overlay routine
5390=0
5400REM----End of Overlay area 1
```

Listing 3.

```
5000REM----------------------
5010REM Overlay area 2.
5020REM  -routine2A
5030REM----------------------
5040DEF FNroutine2A(s$)
5050LOCAL reply$,overlay_number
5060PRINT 'f1b0$;" 2A ";f0h1$;' called from ";f1b0$;s
$;f0b1$
5070REPEAT
5080REPEAT
5090PRINT "Type :-"
5100PRINT "RETURN to exit this overlay routine, or"
5110PRINT "1A,1B or 2A to enter another routine"
5120INPUT reply$
5130UNTIL reply$="1A" OR reply$='1B" OR reply$="2A" O
R reply$=""
5140IF reply$="" THEN 5180
5150overlay_number=EVAL(MID$(reply$,1,1))
5160PROCo("routine"+reply$+"(""routine2A"")",overlay_
number)
5170PRINT f1b0$;" 2A ";f0b1$;' return from overlay ca
ll"
5180UNTIL reply$=""
5190REM exit from overlay routine
5200=0
5210REM====End of Overlay area 2
>
```

Listing 4.

```
10REM BBC Overlay Handler Demonstration
20REM by P. Andrews April 1984.
30IF PAGE<>&1900 THEN PAGE=&1900:CHAIN"ROOT"
40ON ERROR MODE 7:REPORT:PRINT " AT ";ERL:END
50*OPT 1,0
60:
70REM set up size of overlay area.
80:
90S%=1200
100:
110REM set up pointer to start of overlay area.
120:
130O%=LOMEM-2
140:
150REM reserve space for overlay area.
160:
170LOMEM=LOMEM+S%
180:
190PROCinitialise_overlay_handler
200:
210MODE 4
220:
230PROCscreen_display
240:
250PROCwindow(0,31,39,26,0,3,TRUE)
260:
270PROCroot_routine
280:
290PRINT f1b0$
300VDU7:PRINT "--End of demonstration--"
310PRINT "(use CHAIN not RUN to try again)."
320STOP
330:
340REM============================
350REM Root Procedure Definitions.
360REM============================
370DEF PROCscreen_display
380VDU 19,0,4;0;
390PROCrectangle(750,300,800,350)
400PROCrectangle(750,600,300,700)
410PROCrectangle(750,300,1,700)
420PROCrectangle(100,600,250,1)
430PROCrectangle(400,600,250,1)
440PROCrectangle(32,495,1,480)
```

(listing 4 continued on next page)

(listing 4 continued from previous page)

```
450PROCrectangle(0,975,1,608)
460PROCellipse(0,-PI,250,600)
470PROCellipse(2*PI,0,250,650)
480PRINT TAB(0,0)"Max overlay nest"
490PRINT TAB(18,0)"0"
500PRINT TAB(24,2);"Variables"
510PRINT TAB(26,18)"Root"
520PRINT TAB(35,12)"TOP"
530PRINT TAB(35,11)"&";~TOP
540PRINT TAB(35,20)"&";~PAGE
550PRINT TAB(35,21)"PAGE"
560PRINT TAB(35,1)"&";~LOMEM
570PRINT TAB(35,2)"LOMEM"
580PRINT TAB(1,15)"Overlay nesting"
590PRINT TAB(5,5)"Disc"
600PRINT TAB(4,8)"OVER1";TAB(4,10)"OVER2"
610f1b0$=CHR$(17)+CHR$(1)+CHR$(17)+CHR$(128)
620f0b1$=CHR$(17)+CHR$(0)+CHR$(17)+CHR$(129)
630ENDPROC
640REM==========================
650DEFPROCellipse(start,end,x,y)
660LOCAL step,angle
670MOVE x+150,y
680step=(end-start)/30
690FOR angle=start TO end STEP step
700DRAW x+150*COS(angle),y+45*SIN(angle)
710NEXT
720ENDPROC
730REM==========================
740DEFPROCrectangle(x,y,height,width)
750MOVE x,y
760DRAW x+width,y
770DRAW x+width,y+height
780DRAW x,y+height
790DRAW x,y
800ENDPROC
810REM==========================
820DEFPROCmovestring(x1,x2,y,s$)
830LOCAL x,step
840PROCwindow(x2-1,10,x2+7,6,1,0,TRUE)
850x1=x1*32:x2=x2*32:y=1023-y*32
860VDU5
870GCOL 0,1
880MOVE x1,y:PRINT s$
890FOR x=x1 TO x2-32 STEP 32
900TIME=0:REPEAT UNTIL TIME>5
910GCOL 3,1
920MOVE x,y
930PRINT s$:MOVE x+32,y:GCOL 0,1:PRINT s$
940NEXT
950MOVE x1,y:PRINT s$
960PROCrectangle(400,600,250,1)
970PROCrectangle(750,300,800,350)
980GCOL 0,1
990VDU4
1000ENDPROC
1010REM==========================
1020DEF PROCroot routine
1030LOCAL reply$,overlay_number
1040PRINT f1b0$;" Root ";f0b1$
1050REPEAT
1060REPEAT
1070PRINT "Type :-"
1080PRINT "RETURN to exit this demonstration, or"
1090PRINT "1A,1B or 2A to enter another routine"
1100INPUT reply$
1110UNTIL reply$="1A" OR reply$="1B" OR reply$="2A" O
R reply$=""
1120IF reply$="" THEN 1170
1130overlay_number=EVAL(MID$(reply$,1,1))
1140PROCo("routine"+reply$+"(""ROOT"")",overlay_numbe
r)
1150PRINT f1b0$;" Root ";f0b1$;
1160PRINT " return from overlay call"
1170UNTIL reply$=""
1180ENDPROC
1190REM==========================
1200DEFPROCwindow(x1,y1,x2,y2,f,b,clear_flag)
1210VDU 28,x1,y1,x2,y2
1220COLOUR f
1230COLOUR b+128
1240IF clear_flag THEN CLS
1250ENDPROC
1260REM==========================
1270REM Overlay handler routines
1280REM==========================
1290DEFPROCinitialise_overlay_handler
1300max_nest=8:root=255:this_ov=255:max_depth=0
1310DIM oscstr 15,ov_nest max_nest
1320ov_idx=0:ov_nest?0=root
1330ENDPROC
1340REM==========================
1350DEFFNom(str%,ov_call$,ov_no)
1360REM routine to Load overlay.
1370LOCAL ret,ret$
1380IF ov_idx>=max_nest THEN VDU 7,7,7:GOTO 1640
1390IF ov_no<0 OR ov_no>255 THEN PRINT "illegal overl
ay":STOP
1400ov_idx=ov_idx+1
1410IF ov_idx>max_depth THEN max_depth=ov_idx
1420PROCwindow(18,0,19,0,1,0,TRUE)
1430PRINT ;max_depth;
1440ov_nest?ov_idx=ov_no
1450IF this_ov=ov_no THEN 1500
1460REM the overlay must be loaded into store.
1470PROCmovestring(4,25,6+2*ov_no,"OVER"+STR$(ov_no))
1480PROCosc_command("LOAD over"+STR$(ov_no)+" "+STR$~
(0%))
1490this_ov=ov_no
1500PROCwindow(1,26,22,16,1,0,FALSE)
1510PRINT TAB(0,ov_idx)ov_call$
1520PROCwindow(0,31,39,26,0,1,TRUE)
1530IF str% THEN ret$=EVAL("FN"+ov_call$) ELSE ret=EV
AL("FN"+ov_call$)
1540PROCwindow(1,26,22,16+ov_idx,1,0,TRUE)
1550ov_idx=ov_idx-1
1560REM need to load overlay?
1570IF ov_nest?ov_idx=this_ov THEN 1630
1580this_ov=ov_nest?(ov_idx)
1590IF this_ov=root THEN this_ov=ov_nest?(ov_idx+1):G
OTO1630:REM return to root.
1600REM need to load previous overlay.
1610PROCmovestring(4,25,6+2*this_ov,"OVER"+STR$(this_
ov))
1620PROCosc_command("LOAD over"+STR$(this_ov)+" "+STR
$~(0%))
1630PROCwindow(0,31,39,26,0,1,TRUE)
1640IF str% THEN =ret$ ELSE =ret
1650REM==========================
1660DEFFNo(ov_call$,ov_no)
1670=FNom(FALSE,ov_call$,ov_no)
1680REM==========================
1690DEFFNSo(ov_call$,ov_no)
1700=FNom(TRUE,ov_call$,ov_no)
1710REM==========================
1720DEFPROCo(ov_call$,ov_no)
1730LOCAL t
1740t=FNom(FALSE,ov_call$,ov_no)
1750ENDPROC
1760REM==========================
1770DEFPROCosc_command(command$)
1780REM Proc. to achieve *LOAD
1790$oscstr = command$
1800X%=oscstr MOD 256
1810Y%=oscstr DIV 256
1820CALL &FFF7
1830ENDPROC
1840REM====End of Root==========
```

(continued from previous previous)

used since it has been modified.

In the demonstration listing the size of the overlay area is specified. *Info should be used to determine the size of the overlay files produced. For example:

e.g. *INFO OVER1

OVER1 1900 801F 2000 A7

The size of Over1 is &2000 bytes so the overlay area must be at least this big for the overlay to fit. The total size of the program will be:

program size = TOP – PAGE + overlay size – 2

When choosing line numbers, the root must have the lower line numbers and the overlay routine the higher numbers. No overlay module can contain the same range of numbers as the root, but separate overlay modules can share the same range.

Care must be taken when correcting errors. If the root is changed after an overlay is loaded and then Saved it will be too big because both root and overlay will have been saved. Always load the root or relevant overlay before making alterations.

Obscure errors can arise if the overlays are called incorrectly. Two errors can cause great confusion — clashing line numbers between the root and overlay modules and also two routines with the same name occurring in different overlay modules. ■

Write programs to unlock the multitasking power of your QL!

*Use Metacomco's much acclaimed **Development Kits** to create the software for your QL: Use **Assembler** for its speed, and for access to the QL's many features; use **BCPL** for systems programming; writing games, utilities, and applications packages; use **LISP** for manipulating data structures, and for exploring the world of artificial intelligence.*

RELEASE THE POWER OF THE QL

ASSEMBLER £39.95 INC. VAT + P&P

> Standard Motorola 68000 mnemonics.
> English error messages.
> Produces code which can be EXECed, and run as a concurrent job.
> External references allow linkage to high level languages.
> Integral linker allows assembler programs to be linked together.
> Macro expansions.
> Position independent, absolute or relocatable code can be produced.
> Conditional assembly.
> Large range of directives.
> Fully formatted listings.
> 30 character variable names and 32-bit values.

ENHANCED!
NOW INCLUDES ASSEMBLER LINKER*
AND NEW LOW PRICE £39.95

BCPL £59.95 INC. VAT + P&P

> True compiler.
> Multiple BCPL programs can run concurrently.
> Full runtime library includes interfaces to QDOS graphics, file operations, window handling, etc.
> Exception handling provides diagnostics for debugging.
> Link loader allows linkage of separately compiled segments.
> Assembler and BCPL modules can be linked together.
> 32-bit variables use the full QL address space.

LISP £59.95 INC. VAT + P&P

> Full support of QL features including window graphics, and screen handling.
> Compatible with Acornsoft Lisp for the BBC micro.
> Interpreter.
> Turtle graphics.
> Structure editor allows alteration of data structures.
> Prettyprinter displays programs in structured format.
> Tracer to aid in debugging.
> Garbage collector automatically recovers spare memory space.
> 28-bit integers and 250-character names.

Each language is supplied as a complete Development Kit which includes the software (on a Microdrive Cartridge), Metacomco's popular full screen editor, and user manual.

The Metacomco Development Kits are available from HMV, Menzies and many other leading retailers, or direct from Metacomco.

METACOMCO
26 Portland Square, Bristol BS2 8RZ.
Tel: Bristol (0272) 428781

*Existing registered users can obtain an upgrade. Contact Metacomco for details.
QL & QDOS are the trade names of Sinclair Research Ltd.

NAME
ADDRESS
POSTCODE
TEL. NO.
SIGNATURE

Phone today, or post this coupon to: Metacomco, 26 Portland Square, Bristol BS2 8RZ.
Please send me:
The Assembler Development Kit at £39.95 ____
The BCPL Development Kit at £59.95 ____
The LISP Development Kit at £59.95 ____
I enclose a cheque for £ ____ or debit my ACCESS/VISA Account No.

Card expiry date: ____

Price includes VAT, postage and packing UK mainland only. Delivery allow up to 28 days. YC2

THE INVISIBLE TOOLKIT

Stuart Clarke presents a number of machine-code routines for the ZX-81 which are driven by a short Basic menu.

THE INVISIBLE TOOLKIT is a suite of fast efficient machine-code routines driven by a short Basic menu. Due to the fact that extensive use is made of routines already present in the Rom the machine-code is written in less than 800 bytes, which together with the Basic lines occupies less than 1800 bytes of memory.

The program was written to make it easier to modify and develop a Basic program and even combine two or more Basic programs — or routines — so that the idea of having a library of useful subroutines on cassette is quite feasible. In addition, the facility to create large Rems, or delete them at a stroke, is invaluable when assembling machine-code.

The following routines are available:

DOWN CODE — used after Up Code. Downloads the copy in upper memory into a specified line and Address. Space is automatically created.

DOWN BASIC — used after Up Basic. Brings the Basic copy down into the Basic area placing it according to the first line number of the block.

LINE ADDRESS — gives the address of the specified line number. The first character is four bytes further on.

REM EXPAND — expands the Rem statement with the specified line number, from a specified address, by a given number of bytes.

UP CODE — copies a given number of bytes from a given address, into upper memory.

UP BASIC — copies a block of Basic lines specified by first and last lines.

BLOCK DELETE — specify first and last lines.

RENUMBER BASIC — renumbers a block of Basic lines specified by first and last lines. You are allowed to specify both the Increment and the New first line number. All non-computed Gotos, Gosubs, and Runs will be correctly changed, provided the line number is in four-digit form, e.g., Goto 1 as Goto 0001.

RENUMBER COPY — used after Up Basic. Only requires the Increment and New first line number to be specified.

The order in which the routines are listed may seem a little odd, but this is as they appear in the menu. This is dictated by the use of relative rather than absolute jumps in the machine-code to allow it to be position independent, and the entire program has been written in such a way that, as well as the machine code, the Basic menu can be transferred to upper memory — without overwriting existing upper memory contents — to allow the Loading of subsequent programs.

When required, the menu can be recalled, and it will not clash with the existing Basic as its lines are numbered A222 to A239 — 10222 to 10239. This is possible since the Rom checks the validity of a line number by only comparing the high byte with 40 decimal — 40 times 256 equals 10240, the first "non-valid" line number.

However, line numbers in the range 10000 to 11239 are only obtained by using the Renumber routine, as 9999 is the largest line you can enter direct from the keyboard. The menu lines are now tagged on to the end of the program you have just Loaded.

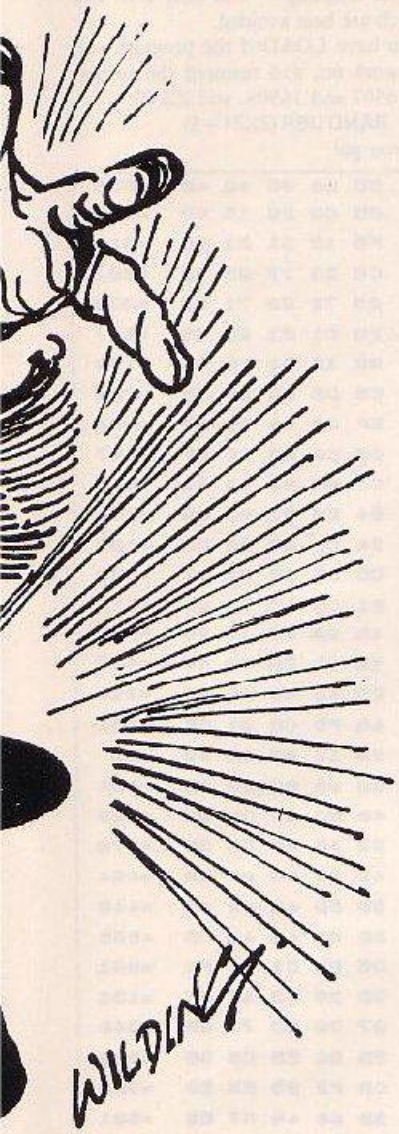
Report codes.

K/A234	you have attempted to use Down Code when no copy exists in upper memory.
T/A233	you have attempted to use Down Basic or Renumber Basic when the "live" copy is not Basic.

System variables.

16388-16389	Ramtop
16507-16508	Old Ramtop
16444-16451	Poked by menu
ZX81	variable pointing to the first location in the "jump table" accessing the machine-code routines.

If the typing seems a bit of a chore, just send your name and address with a cheque for £3 made payable to Sarglen Software, to 147



BLE
LKIT

South Parks Road, Glenrothes, Fife, KY6 1NT, and I will send you a quality cassette with two copies each for machines with and without the "improved Rom", together with an instruction leaflet.

Type in program 1, then duplicate line 1 using the Edit key so that you have 12 identical lines, numbered 1 to 12. Now Run program 1.

Type in program 2, and Run it. This is the hex loader. Enter the address 16544 — or the appropriate address if you are resuming after a break — and enter the hex codes listed in figure 1. You may enter any number of bytes at a time, and the screen display should tally with figure 2. If you make a mistake input "S", which will stop the program. To recommence, simply Goto 10, and enter your new starting address.

When this is complete — and you should have Saved your program at several stages — Save the program thus far.

If your ZX-81 has the "unimproved" Rom, identified by Print Peek 5404 giving 253, then you must enter the five Pokes in fig.2 before Saving and proceeding further.

Type in program 3. This is most of the Basic required to transfer the code to upper memory and provide the operating menu. When you have Saved this, Run it. You should now have the menu on screen, so select 8 — Renumber — and enter the numbers 290, 460, 1, and 10222 in response to the prompts. Almost immediately, the menu lines will be renumbered from A222 to A239 — 10222 to 10239.

If all is well, type in program 4, the remaining Basic, and Save the program again. You are now ready to Save this, the final completed program in auto-run mode. To do this simply Run the program whilst recording in the usual way. When the program has Saved, you will find that the Basic program area has been cleared and the menu lines are now stored above Ramtop where they will remain until required. Similarly, this occurs when you Load the auto-run version.

The Invisible Toolkit is now ready to use, so refer to the instructions and try it out.

Using the toolkit is easy. After Loading,

RAND USR (ZX81 + 2)

retrieves the Basic from above Ramtop, and Goto 10222 displays the menu. The first

(continued on next page)

Program 1.

```
  1 REM ........................
.............................
........
 20 POKE 16511,68
```

```
 30 POKE 16512,3
 40 FOR N=16514 TO 17347
 50 POKE N,1
 60 NEXT N
```

Program 2.

```
  10  INPUT S
  20  LET A$=""
  30  GOSUB 0160
  40  IF A$="" THEN INPUT A$
  50  IF A$="S" THEN STOP
  60  LET X=16*CODE A$+CODE A$(2)
-476
  70  POKE S,X
  80  LET Y=Y+X
  90  LET C=C+1
 100  LET S=S+1
 110  PRINT A$( TO 2);" ";
 120  LET A$=A$(3 TO )
 130  IF C=5 THEN GOSUB 0150
 140  GOTO 0040
 150  PRINT TAB 25;Y
 160  LET Y=0
 170  LET C=0
 180  PRINT S;TAB 8;
 190  RETURN
```

Program 3.

```
  10 LET F=16568
  20 LET L=764
  30 POKE 16444,F-256*INT (F/256
)
  40 POKE 16445,INT (F/256)
  50 POKE 16446,L-256*INT (L/256
)
  60 POKE 16447,INT (L/256)
  70 RAND USR 16767
  80 RAND USR 16522
  90 LET ZX81=PEEK 16388+256*PEE
K 16389+153
 100 FAST
 110 FOR N=0 TO 21
 120 PRINT "
                                  "
 130 NEXT N
 140 PRINT AT 1,1;"
 150 PRINT AT 3,6;"ZX81=";ZX81;A
T 5,6;"PEEK 16507=";PEEK 16507;A
T 7,6;"PEEK 16508=";PEEK 16508
 160 PRINT AT 10,1,"
 170 PRINT AT 12,6," RAND USR (Z
X81+2)"
 180 PRINT AT 15,1,"
;H) 1/,6;"GOTO 10222"
 290 FAST
 300 PRINT AT 0,10,"
";AT 2,0;"1.DN CODE-:LINE:AD
DR:";AT 4,0;"2.DNBASIC-:";AT 6,0
;"3.LN ADDR-:LINE:";AT 8,0;"4.RE
M EXP-:LINE :BYTE:ADDR:";AT 10,0
;"5.UP CODE-:ADDR:BYTE:";AT 12,0
;"6.UPBASIC-:1ST :LAST:";AT 14,0
;"7.BLK DEL-:1ST :LAST:";AT 16,0
;"8.RENUM.B-:1ST :LAST:INCR:NEWL
:";AT 18,0;"9.RENUM.C-:
:INCR:NEWL:";AT 21,0;"ENTER NO."
 310 INPUT N
 320 PRINT AT 2*N,1;"
 330 FOR M=1 TO 4
 340 INPUT Z
 350 PRINT AT 2*N,5*M+5;"      ";
AT 2*N,5*M+4;Z
 360 POKE 16442+M*2,Z-256*INT (Z
/256)
 370 POKE 16443+M*2,INT (Z/256)
 380 NEXT M
 390 CLS
 400 IF N=2 OR N=9 THEN RAND USR
 (ZX81+590)
 410 IF N=1 OR N=2 OR N=9 THEN R
AND USR (ZX81+595)
 420 LET ZX82=USR (ZX81+2*N-2)
 430 IF N=5 OR N=6 OR N=9 THEN R
AND USR (ZX81+501)
 440 IF N=3 THEN PRINT "ADDRESS
OF LINE ";PEEK 16444+256*PEEK 16
445;" IS ";ZX82
 450 REM
 460 REM
```

Program 4.

```
   2 SAVE "TOOLKIT"
 190 FAST
 200 POKE 16444,10222-256*INT (1
0222/256)
 210 POKE 16445,INT (10222/256)
 220 POKE 16446,10239-256*INT (1
0239/256)
 230 POKE 16447,INT (10239/256)
 240 RAND USR (ZX81+10)
 250 POKE 16444,1
 260 POKE 16445,0
 270 LET N=7
 280 GOTO 10235
```

(continued from previous page)

prompt requires you to input your selection — 1 to 9 — and the next four prompts expect numerical input, for example line number, Address — or any number if the menu indicates a blank.

When you wish to Load another program on which to use the toolkit, there are a couple of things to remember. First make sure that the menu lines are back above Ramtop — if not, use Copy Basic to do so. Then note down the contents of locations 16507 and 16508, as you will need to restore them after Loading.

Also, the variable ZX-81 will have to be restored after Loading — also after Run and Clear, which are best avoided.

After you have LOADed the program you intend to work on, and restored the system variables 16507 and 16508, and ZX-81

RAND USR (ZX81 + 2)

and away you go!

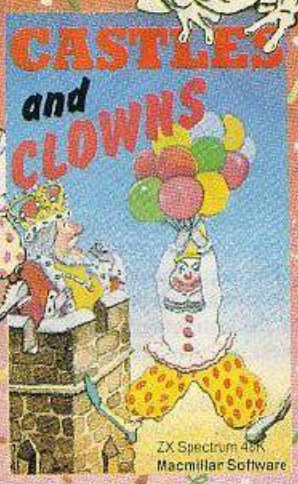
Figure 1.

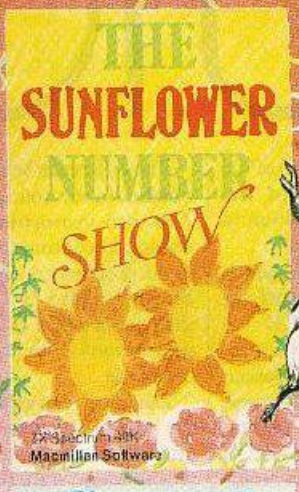
```
16514  00 00 D1 00 53   =292
16519  00 76 76 ED 5B   564
16524  04 40 ED 53 7B   =511
16529  40 21 81 40 CD   =495
16534  A5 40 D5 3E 02   =506
16539  CD A5 40 CD AD   =812
16544  40 3D 20 F7 C9   =605
16549  23 4E 23 46 EB   =453
16554  09 EB C9 EB FD   =933
16559  E1 C1 C5 71 23   =763
16564  70 EB FD E9 2A   =875
16569  3C 40 CD D8 09   =554
16574  E5 2A 3F 40 23   =432
16579  CD D8 09 D1 CD   =844
16584  17 0A C9 2A 04   =280
16589  40 E5 2A 3E 40   =461
16594  18 13 18 F5 21   =345
16599  10 27 22 2B 40   =196
16604  2A 04 40 E5 CD   =544
16609  BB 05 EB CD D8   =848
16614  09 E5 2A 7B 40   =467
16619  ED 5B 04 40 CD   =601
16624  17 0A E1 E5 C5   =684
16629  2B CD 9E 09 C1   =608
16634  D1 E1 C5 ED B0   =1044
16639  C1 C5 2A 02 40   =480
16644  09 22 02 40 ED   =346
16649  73 36 40 2A 36   =329
16654  40 09 F9 A7 ED   =726
16659  42 ED 5B 04 40   =462
16664  EB A7 ED 52 44   =789
16669  4D ED 5B 7B 40   =592
16674  2A 04 40 ED 53   =430
16679  04 40 18 2B ED   =375
16684  B8 18 34 2A 3C   =362
16689  40 CD D8 09 44   =562
16694  4D C9 ED 4B 3E   =652
16699  40 2A 40 40 2B   =277
16704  E5 C5 CD 9E 09   =798
16709  C1 E1 C5 41 3E   =742
16714  18 23 77 10 FC   =449
16719  18 13 18 81 18   =219
16724  81 18 D8 18 DF   =816
16729  18 24 18 2B 18   =151
16734  77 18 77 18 77   =405
16739  2A 3C 40 CD D8   =587
16744  09 C1 20 0B 23   =280
16749  23 5E 23 56 EB   =435
16754  09 EB 72 2B 73   =516
16759  2A 29 40 09 22   =190
16764  29 40 C9 2A 3C   =408
16769  40 ED 4B 3E 40   =502
16774  18 03 CD B8 40   =480
16779  C5 D5 E5 CD C5   =1041
16784  0E 2A 04 40 22   =158
16789  76 40 A7 ED 42   =657
16794  22 04 40 C5 E5   =528
16799  2A 02 40 A7 ED   =512
16804  42 22 02 40 ED   =403
16809  73 36 40 2A 36   =329
16814  40 A7 ED 42 F9   =783
16819  09 ED 5B 7B 40   =524
16824  EB A7 ED 52 44   =789
16829  4D 2A 36 40 ED   =474
16834  73 5D 40 ED 5B   =600
16839  5D 40 ED B0 E1   =795
16844  C1 D1 D5 EB ED   =1087
16849  B0 E1 D1 C1 C9   =1004
16854  18 04 18 1E 18   =105
16859  12 CD B8 40 C5   =665
16864  CD 60 0A 2A 29   =394
16869  40 A7 C1 ED 42   =727
16874  22 29 40 C9 FD   =593
16879  CB 01 EE FD CB   =898
16884  01 A6 18 52 FD   =526
16889  CB 01 AE FD CB   =834
16894  01 A6 21 7D 40   =389
16899  FD CB 01 9E E5   =844
16904  23 23 23 23 7E   =266
16909  FE FA 20 04 FD   =793
16914  CB 01 DE 7E FE   =606
16919  76 C1 23 28 1F   =417
16924  2B C5 7E CD B4   =751
16929  07 7E FE EC 28   =663
16934  25 FE ED 28 21   =601
16939  FE F7 28 1D FD   =823
16944  CB 01 3C 20 20   =365
16949  DF E1 CD F2 09   =904
16954  EB ED 5B 0C 40   =639
16959  A7 E5 ED 52 E1   =940
16964  28 04 18 BB 18   =279
16969  B6 18 3C 23 23   =335
16974  23 23 23 E5 7E   =460
16979  CD B4 07 20 2D   =469
16984  23 7E FE 76 20   =565
16989  27 E1 E5 FD CB   =949
16994  01 65 20 29 23   =211
16999  7E 23 5E 23 56   =375
17004  23 4E 23 46 CD   =423
17009  8D 15 C5 E1 CD   =789
17014  D8 09 18 02 18   =275
17019  BH E5 C1 E1 2B   =876
17024  70 2B 71 18 B1   =469
17029  D1 18 AE FD CB   =563
17034  01 66 28 58 C9   =432
17039  2B 56 2B 5E EB   =601
17044  CD BB 05 42 4B   =538
17049  C5 CD 20 15 CD   =660
17054  F8 13 C1 E1 E5   =914
17059  C5 23 77 23 73   =501
17064  23 72 23 71 23   =332
17069  70 C1 E1 2B 18   =597
17074  02 18 93 16 04   =199
17079  E5 D5 CD 20 15   =700
17084  EF C0 34 01 0A   =494
17089  00 CD 20 15 EF   =497
17094  C1 05 24 C2 E1   =653
17099  04 E2 01 03 E2   =455
17104  34 CD A7 0E C5   =635
17109  CD CD 15 C1 D1   =833
17114  E1 C6 1C 77 2B   =513
17119  15 20 D5 18 56   =440
17124  18 CD 2A 7B 40   =458
17129  22 46 40 2A 04   =214
17134  40 FD CB 01 6E   =531
17139  20 18 00 00 00   =56
17144  00 00 00 2A 3E   =104
17149  40 23 CD D8 09   =529
17154  22 46 40 2A 3C   =270
17159  40 CD D8 09 00   =494
17164  00 ED 4B 40 40   =440
17169  ED 5B 42 40 C5   =655
17174  D5 D1 C1 7A FE   =001
17179  28 38 03 11 0F   =131
17184  27 72 23 73 2B   =346
17189  EB 09 EB C5 D5   =889
17194  CD F2 09 EB ED   =928
17199  5B 46 40 A7 E5   =621
17204  ED 52 E1 20 DE   =798
17209  D1 D1 FD CB 01   =875
17214  E6 FD CB 01 6E   =797
17219  C0 18 9E 21 FE   =661
17224  27 CD B8 09 23   =504
17229  23 5E 23 56 13   =269
17234  13 72 2B 73 19   =316
17239  2B 01 02 00 C5   =243
17244  E5 CD 9E 09 D1   =810
17249  C1 21 7B 40 ED   =650
17254  B0 C9 CD 23 0F   =632
17259  21 FE 27 CD D8   =747
17264  09 23 23 5E 23   =208
17269  56 D5 1B 1B 72   =467
17274  2B 73 D1 D5 19   =605
17279  7E FE EA 20 07   =653
17284  D1 2B 72 2B 73   =524
17289  CF 13 D1 01 02   =438
17294  00 C5 11 7C 40   =402
17299  ED B6 23 C1 E5   =878
17304  09 EB E1 CD 60   =770
17309  0A C9 2A 04 40   =321
17314  7E FE 20 00 09   =477
17319  2A 7B 40 2B 7E   =398
17324  FE 76 28 02 CF   =621
17329  1C C9
```

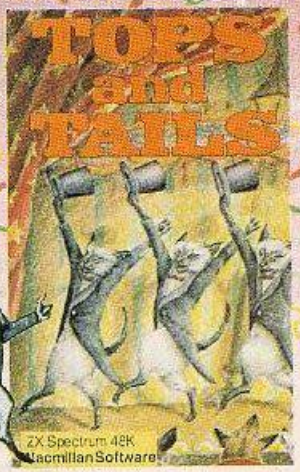
Figure 2.

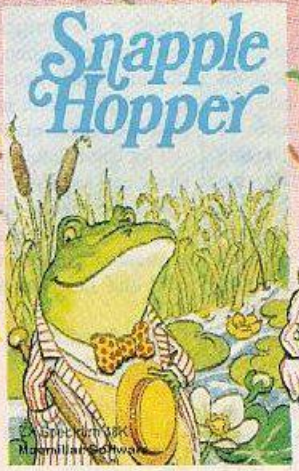
```
POKE 17051,28
POKE 17054,244
POKE 17082,28
POKE 17091,28
POKE 17110,201
```

Something to celebrate!









Space Scan

A must for every would-be astronomer. Discover the key stars, nebulae and galaxies of the Northern Skies.
48K Spectrum
£5.95

Quiztimer

A unique multi-feature quiz game for one or two players. Ten huge quiz files provided – or make your own. Superb graphics.

48K Spectrum	BBC B
£5.95	**£6.95**

The Sunflower Number Show

Battle against drought, a deadly weevil or poison ivy to save your garden from disaster! A colourful test of mental arithmetic for all ages.

48K Spectrum	BBC B
£5.95	**£6.95**

All recommended retail prices including VAT. Spectrum versions are microdrive compatible.

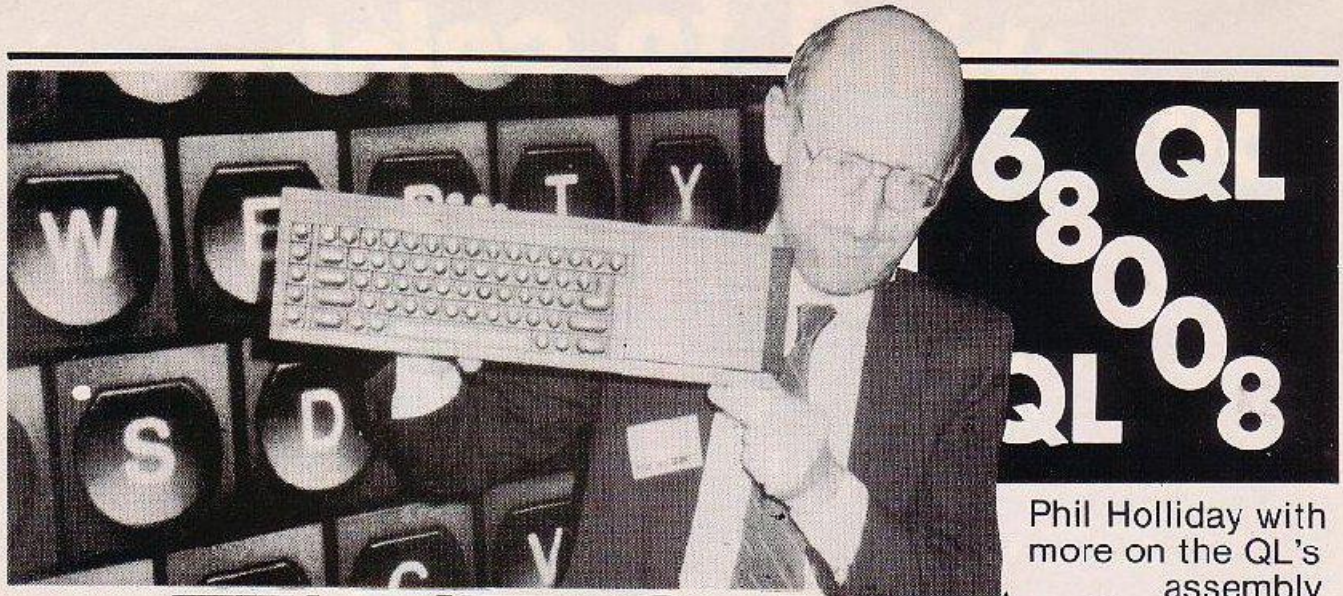
Snapple Hopper
Tops and Tails
Castles and Clowns

Cats and kings, frogs and clowns all add up to fun-packed games giving kids a head start in reading. Devised by Betty Root, one of Britain's top reading experts. Unbeatable value – two games on each cassette.

48K Spectrum	BBC B/Electron
£5.95	**£6.95**

Available from your local software dealer. In case of difficulty contact Martin Neild on the Macmillan Software hotline 01 836 6633

MACMILLAN SOFTWARE



68008 QL TUTORIAL

Phil Holliday with more on the QL's assembly language.

THIS MONTH I complete the description of the 68008 instruction set which I started last month. I also provide a brief introduction to QDOS.

Three instructions are included which operate on byte sized operands and perform Bindary Coded Decimal — BCD — arithmetic. The add decimal with extend instruction — ABCD — adds the source operand and destination operand and extend bit together using BCD arithmetic, placing the result in the destination operand and if necessary setting the extend bit to allow multi-precision BCD arithmetic.

The operands must either both be contained in data registers, or else in memory locations addressed indirectly through address registers. In the case of memory to memory addition only the predecrement addressing mode is available, to facilitate multi-precision addition.

The subtract decimal with extend instruction — SBCD — subtracts the source operand and extend bit from the destination operand using BCD arithmetic. The addressing modes are the same as for the ABCD instruction.

The negate decimal with extend instruction — NBCD — subtracts the desination operand, which is of size byte, and the extend bit, from zero placing the result in the destination. Thus the instruction produces the ten's complement of a BCD number if the extend bit is reset and the nine's complement otherwise.

Program control instructions cover jump, branch, set and returns, both conditional and unconditional. First, a word about the 68008 notation which I find confusing. To me a jump is the assembler equivalent of a Goto instruction whereas a call is the equivalent of a Gosub instruction. In the 68008 instruction set both branch and jump — BRA and JMP — are used as Goto and branch to sub routine and jump to subroutine — BSR and JSR — are used as Gosub.

The difference between branch and jump — whether to sub routine or not — is as follows: A branch instruction can cause program execution to continue at a displacement relative to the program counter. The displacement can be either signed byte — to give a short branch shown as a suffix .S after the instruction — or signed word. This produces position independent code.

The jump instruction on the other hand can use many different addressing modes, and thus allows a jump to an address greater than plus or minus 32K from the program counter which is the limitation of the branch instruction. In fact a jump can use any effective addressing mode other than the obvious ones, i.e, register direct modes, pre-decrement and post-increment modes and immeciate modes.

The conditional instructions provide branching and setting on the following conditions. The table below shows the mnemonic, the condition and the state of the flags for the test to succeed. Note that true test will always succeed and the false test will always fail. The equal test will only succeed if the zero (Z) bit is asserted.

Code	Condition	Test
T	true	1
F	false	0
HI	high	not C , not Z
LS	low or same	C + Z
CC	carry clear	not C
CS	carry set	C
NE	not equal	not Z
EQ	equal	Z
VC	overflow clear	not V
VS	overflow set	V
PL	plus	not N
MI	minus	N
GE	greater or equal	N . V + not N . not V
LT	less than	N. not V + not N . V
GT	greater than	N . V . not Z + not N . not V . not Z
e	ss or equal	Z + N . not V + nct N . V

So now on to the actual instructions first, the branch instructions. The branch always — BRA, branch conditional — Bcc — and branch to subroutine — BSR — all produce a program counter relative branch. The conditional instruction is formed by taking the required conditional mnemonic and replacing the cc to give BEQ,BNE etc.

There is also a test condition, decrement and branch instruction (DBcc) which I described last month.

The jump instructions follow a similar pattern and are hump — JMP — and jump to subroutine — JSR. You will see that there is no conditional jump and so if you need to jump rather than branch conditionally you will need to perform a conditional branch to a jump instruction.

The set according to condition instruction — Scc — sets a byte operand to true — all ones — if the condition is true, else it sets the byte to false — all zeros.

There are two Return instructions to enable return from a subroutine. Return from subroutine — RTS — pulls the program counter from the top of the stack. Return and restore pulls both the condition codes and program counter from the stack. Note however, that branch and jump to subroutine instructions do not store the condition codes on the stack so if you wish to use this instruction your subroutine must store the condition codes on the stack at the start of the subroutine.

System control instructions fall into three categories, i.e. privileged, trap generating and status register instructions.

As was briefly mentioned in last month's article the 68008 can operate in two different modes, namely user and superviser mode. Superviser mode is the indicated by bit 13 of the status register being set, and provides some additional instructions — i.e. privileged

instructions — which are not available when operating in user mode. They are as follows:

Three instructions are provided to provide immediate bitwise logical manipulation of the status register. They are ORI to SR, ANI to SR and EORI to SR and all have size word.

A special move instruction, move to status register, is available with operand size word which allows the whole of the status register to be loaded. So far all these instructions are privileged because they potentially can set the superviser bit in the status register, and this is not a facility available to programs operating in user mode.

There is also an instruction to move the user stack pointer to an effective address. This enables the user stack to be examined when in superviser mode.

And finally in the privileged set of instructions there are Stop which halts the program execution, Reset which resets external devices and return from exception — RTE — which is a return from interrupts, traps and pulls both the status register and program counter from the stack.

There are three trap generating instructions, trap — Trap — trap on overflow — TrapV — and check register against bounds — CHK. A trap forces execution to continue at an address held in a table of vectors near the bottom of program memory and also causes the processor to enter supervisor mode. There are 16 Trap vectors, and the first five, i.e., Trap # 0 forces the processor into superviser mode. Trap # 1,2 and 3 are system call traps with the particular call recognised by a number passed in d0.

Trap # 4 is used by the Basic command interpreter. The other traps can be redirected using a QDOS system call. TrapV is used to force a trap on overflow so that the programmer has control of the situations when this would or would not be catastrophic. CHK allows the contents of a data register to be checked against some boundary conditions, forcing a trap exception if the data register is out of bounds.

Finally, the status register instructions which are not privileged. The condition code register — CCR — is the low byte of the status register. So ANDI to CCR, ORI to CCR, EORI to CCR Move to CCR are all byte size versions or the similar instructions already described in the privileged instruction section above. There is also a move status register to effective address which allows the status register to be stored.

A brief introduction to QDOS is an essential part of a series on assembler on the 68008, but brief is the operative word. To do justice to the subject would require a book, and in Part 1 of this series I gave the names of two such books. So instead of attempting to cover the various system calls, etc, I will try to give

you the flavour of QDOS without going into detail.

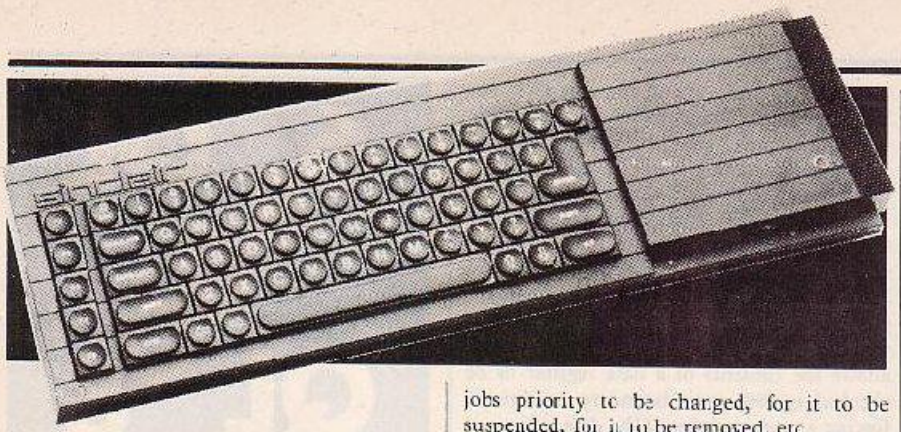
What is QDOS? It is a collection of software procedures — system calls — which can be invoked by assembly language programs — using a Trap instruction — to perform commonly required operations on the QL.

These operations include manager traps which manage the QL's resources, to allocation traps which allocate input and output channels and serial to traps which execute serial i/o operations and include all the screen driver routines.

An executable program — i.e. one which is activated using the Exec command on the QL

(continued on next page)

```
LOC        OBJECT        STMT        SOURCE STATEMENT
                           2
                           3 *Copyright P.A.Holliday 1985
                           4 *demonstration of multi-tasking
                           5 *assembled with METACOMCO assembler
                           6
     =FFFF                 7 this_job  equ -1
                           8
     =0108                 9 mt_susjb  equ $108
     =0111                10 mt_ipcom  equ $111
                          11
                          12 QDOS       macro
                          13            moveq #\1&$FF,d0
                          14            trap #\1/$100
                          15            endm
                          16
                          17 *first initialise loop counter
                          18
0000'  740C               19 start      moveq #12,d2
                          20
                          21 *then go brrr brrr
                          22
0002'  6116               23 loop       bsr.s ring
0004'  6114               24            bsr.s ring
                          25
                          26 *now wait a bit
                          27
0006'  611E               28            bsr.s delay
                          29
                          30 *and loop back if d2 not yet = -1
                          31
0008'  51CA FFF8          32            dbra d2,loop
                          33
                          34 *now wait for 60 secs by suspending job
                          35 *for 3000 frames
                          36
000C'  72FF               37            moveq #this_job,d1
000E'  363C 0BB8          38            move.w #3000,d3
0012'  93C9               39            suba.l a1,a1
                          40            QDOS mt_susjb
0014'  7008               40+           moveq #mt_susjb&$FF,d0
0016'  4E41               40+           trap #mt_susjb/$100
                          41
                          42 *then do it all again
                          43
0018'  60E6               44            bra.s start
                          45
                          46 *sub routine to go brrr
                          47
001A'  47FA 0018          48 ring       lea ptr_blk,a3
                          49            QDOS mt_ipcom
001E'  7011               49+           moveq #mt_ipcom&$FF,d0
0020'  4E41               49+           trap #mt_ipcom/$100
0022'  6102               50            bsr.s delay
0024'  4E75               51            rts
                          52
                          53 *sub routine to suspend job for
                          54 *0.6 second,i.e.40 frames
                          55
0026'  72FF               56 delay      moveq #this_job,d1
0028'  363C 0028          57            move.w #40,d3
002C'  93C9               58            suba.l a1,a1
                          59            QDOS mt_susjb
002E'  7008               59+           moveq #mt_susjb&$FF,d0
0030'  4E41               59+           trap #mt_susjb/$100
0032'  4E75               60            rts
                          61
                          62 *parameter block for beep
                          63 *these were found by trial and error
                          64
0034'  0A                 65 ptr_blk    dc.b $A   beep cmd
0035'  0A                 66            dc.b 10   no of ptrs
0036'  FFF0 0AAA          67            dc.l $FFF00AAA size string
003A'  CA                 68            dc.b 10   pitch 1
003B'  CD                 69            dc.b 13   pitch 2
003C'  8002               70            dc.w 32770  grad_x
003E'  1B20               71            dc.w 6944 duration
0040'  08                 72            dc.b 8    grad_y
0041'  01                 73            dc.b 1    wrap
0042'  00                 74            dc.b 0    rand
0043'  00                 75            dc.b 0    fuzz
0044'  01                 76            dc.b 1    no reply
                          77
                          78            end
```



68008 QL QL

(continued from previous page)

— or on which is in the resident procedure area and is executed with a Call command is known as a job. A job can be in one of three distinct states, known as active, suspended or inactive.

QDOS supports a multi-tasking environment. That is more than one job can appear to be running at the same time. This is not in fact what actually happens. The 68008 processor can only execute one instruction at a time, and so each job is given a priority and is allocated an appropriate slice of the processors time by the scheduler, which is activated 50 times a second by the hardware interrupt.

An active job will have a priority of from 1 to 127 — the higher the number the greater the amount of time allocated to it by the scheduler. A suspended job will have been created with a priority just like an active job, but the scheduler will not allow it to run for a given number of time slices. An inactive job has a priority of 0. The manager traps enable a jobs priority to be changed, for it to be suspended, for it to be removed, etc.

Other manager traps control allocation of memory in the transient procedure area and the resident procedure area, enable communication with the second processor which handles the serial io ports, sound generation and the keyboard. Finally, there are a set of traps which allow QDOS to be extended with additional user written device drivers and interrupt servers, making it possible for instance to extend QDOS to handle disk drives or to perform terminal emulation.

The io allocation traps enable jobs to open and close channels, to format media and to delete files.

The serial io traps enable data to be read or written to an opened channel either a byte at a time or as a string of bytes. The screen driver commands cover operations to modify a window, control the cursor, clear a part of a window, set the colours and perform some graphic operations on a window such as plot, draw etc. There are also some traps to enable the file subsystem to deal with direct access files and entire file load and save.

There are also some utility routines which are not strictly a part of QDOS in that they are not essential to the operation of the QL, and the most important of these utilities is the Basic interpreter.

This months program example will produce a sound like a telephone, whilst any other program, either Basic or executable machine code, is running. The program is commented and is self explanatory. To run it type Exec filename — I have called mine phone exc — and it will ring 12 times, followed by one minutes's delay, after which it will repeat ad nauseam.

Next month I will present a major routine written in assembler. It is a debug program which will allow registers and flags to be displayed and changed, programs to be loaded and then single stepped, and several other features. ■

CALLING ALL ARCADE EXPERTS!
SENSATIONAL NEW GAME FOR THE 48K SPECTRUM:

SHARP SHOOTER

A game which takes real skill to get a high score. A game which tests your eye, your aim and your reflexes. Based on a fairground shooting gallery — but harder!

The main features are:

- 100% machine code for fast, smooth action.
- Superb graphics and sound (yes, sound!)
- Arcade type hall of fame, high score table
- suitable for keyboard, Kempston or ZK2 joysticks

Plus many other exciting features
Send S.A.E. for our "Sharpshooter" facts sheet.
There's nothing quite like it!
Send cheque for £5.50 (inc. p + p) to:

"KOBRAHSOFT"
"Pleasant View", Hulme Lane, Hulme, nr. Longton, Stoke-on-Trent, Staffs. ST3 5BH.

ALL ORDERS PROMPTLY DISPATCHED
DEALER AND DISTRIBUTOR ENQUIRIES WELCOME
AMSTRAD VERSION COMING SOON!

MICRO ANSWERS
70-71 Wilton Road, Victoria, SW1
(3 minutes Walk from Victoria Station)

SOFTWARE BARGAINS

DRAGON, VIC 20, ORIC	Any 2 tapes	40% off R.R.P.
	3-5 tapes	50% off R.R.P.
	6 or more tapes	60% off R.R.P.
B.B.C., CBM 64, SPECTRUM	Any 2 tapes	10% off R.R.P.
	3 or more tapes	25% off R.R.P.
	Selected titles	50% off R.R.P.

HARDWARE AND PERIPHERALS

APPLE IIE + Disc drive + Controller + SANYO Green Screen Monitor	£690.00
BBC A (Basic 2 O.S 1.2)	£235.00
DRAGON Delta 1 Disc drive	£190.00
EPSON FX100 Printer	£450.00
COMMODORE 1541 Disc drive	£175.00
TEXAS Disc drive + Controller	£240.00
TEXAS 32K x 8 RAM expansion	£ 80.00
WESTRA 80 adjustable Work Stations	£ 69.00
GP100 Printer	£190.00

Books up to 25% OFF Wide Selections

All offers are subject to availability. Prices include V.A.T.
Open Monday to Friday, 10am to 6.30pm
Telephone 01-630 5995

FALL GUY

Competition RESULTS

TWO TICKETS to Hollywood were on offer as the first prize in January's Fall Guy competition. For the runners-up there were three BMX bikes. To be in the running you had to identify eight computers from their photographs.

Then we asked you to dream up a title for a new blockbuster TV series or film about computers. The computers in the photographs were as follows: 1. Enterprise; 2. Spectrum +; 3. Newbrain; 4. Atari 600 XL; 5. Acorn Atom; 6. Acorn Electron; 7. Text TX-8000; 8. Commodore Plus 4.

The hope of being Westward Bound inspired a number of highly entertaining entries. Film buffs will spot the references among the following suggestions: "I Married a Blob from Sinclair Research" from A. Miller; "Indiana Jones and the Architecture of the 6800" from P. Manolis; "Hackers of the Late ROM" from A. Johnson.; and C. Lane's "The Kilobyte Syndrome".

One of the best was V. Carrol's "Core Binary! It's 'Cursorman". This was just pipped at the post for the one of the first prizes by "Qwerty Harry with Squint Eastward" from R. H. Storey 18, Conifer Close, Lutterworth, Leics. We awarded the other trip to Hollywood to J. Minson, 6 Muswell Avenue, London N10, who supplied not just one title but a complete TV schedule for a new computer, Channel 5:

5.30 THE CLIVE AND CHRIS SHOW
Zany slapstick comedy from a Cambridge pub.

6.00 NEWS
Read by a Currah Speech Unit.

6.30 KNIGHT RIDER
Thrills and spills as Sir Clive takes to the road in his trustry C5 . . . after dark! Who is the mystery computer magnate in the Rolls Royce behind? Last in the series.

7.15 Q.L. DONGLE
The cop with the detachable bit. Postponed from June 1984.

8.00 SPACE TREK
The good ship Enterprise finally arrives somewhere — even later than Q.L. Dongle!

9.00 NEWS
With sub-titles for those who couldn't understand the Currah.

9.30 THE BIG FILM: THE RISE AND FALL OF THE ROM ADD-ON EMPIRE
(Disaster movie; 1984) The dramatic fortunes of Dave Ian, Bruce and Eugene, four kids living fast in a world that defines Imagination! Not suitable for children.

11.00 INTERNATIONAL BOXING
Jack Tramiel vs The Kommodore Killer. Plus after the (last orders) bell action from The Baron of Beef, Cambridge. Blood 'n' bytes action. Not suitable for anyone.

12.00 HAWAII 5:0
Steve McCarrot investigates a ZX81 Error Code in the Pacific. (B/W)

12.30 CLAIRE RAMERS POCKET COMPUTER
Claire Ramer is forced to betray the confidences of more clients in order to afford new Eproms for her Psion Organiser.

1.00 SHUTDOWN
Caused by an overheating power supply.

Working on the basis that anyone over 18 was too old to win one of the three BMX bikes, we awarded them instead to T. Blacke, 8 Valley Gardens, Downend, Bristol; S. Nolan, 48 Hhanemann Rd, Liverpool; H. Halton, 39 Primrose Lane, Burton Ave., Hunslet, Leeds.

UTILITY OF THE YEAR

The Quill & The Illustrator

The Graphic Adventure Writing System

For The 48K Spectrum

The Quill £14.95 The Illustrator £14.95

GILSOFT
30, Hawthorn Road
Barry. South Glam
0446 - 732765

From Computer shops Nationwide
Or direct from us by post or phone
Credit Card Order Line Staffed 24 Hours Daily
0222 - 41361 Ext 430

software that's hard to beat...

MSX
AMSTRAD
48K SPECTRUM

TASWORD TWO

The Word Processor ✱

"If you have been looking for a word processor, then look no further."
CRASH June 1984

"The number of on-screen prompts, together with the excellent manual, make it ideal – even for an absolute beginner."
PERSONAL COMPUTER WORLD September 1983

"Without doubt, the best utility I have reviewed for the Spectrum."
HOME COMPUTING WEEKLY April 1984

TASWORD TWO ZX 48K Spectrum £13.90

TASWORD MSX

The Word Processor

The Tasman Word Processor for MSX microcomputers.
All the features of the Spectrum version.

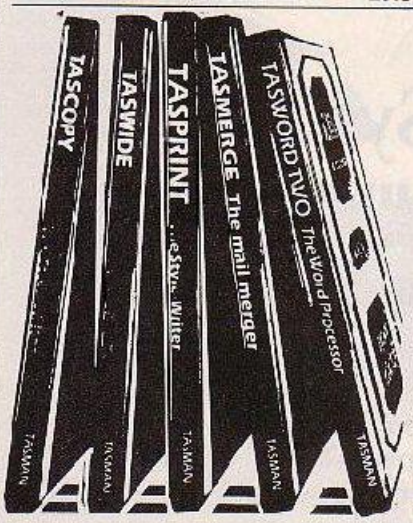
TASWORD MSX MSX Computers £13.90

TASCOPY

The Screen Copier

Screen copy software for Spectrum with Interface 1 and Amstrad CPC 464. Print high resolution screen copies (in a choice of sizes), and also large 'shaded' copies with different dot densities for the various screen colours. Tascopy supports all eight pin dot matrix printers with Epson type control codes, e.g. Epson RX 80 and FX-80, Shinwa CP-80, Mannesmann Tally MT-80, Star DMP 510/515, Brother HR5, and also Amstrad DMP 1 with the CPC 464.

TASCOPY ZX Spectrum £9.90
TASCOPY 464 Amstrad CP 464 £9.90



TASWORD 464

The Word Processor

The Amstrad implementation of Tasword Two plus many extra features.

TASWORD 464 Amstrad CPC 464 £19.95

TASMERGE

The Mail Merger

Transfer data from MASTERFILE to TASWORD TWO! Letters and forms typed on TASWORD TWO can be printed with addresses and data taken from MASTERFILE. The mail merge facility allows, for example, multiple copies of a letter to be printed, each containing a different name and address taken from your MASTERFILE data. To use TASMERGE you must have one or more microdrives as well as TASWORD TWO and MASTERFILE by Campbell Systems. (version 9 or later).

TASMERGE ZX 48K Spectrum £10.90

TASPRINT

The Style Writer

A must for dot-matrix printer owners! Print your program output and listings in a choice of five impressive print styles. TASPRINT utilises the graphics capabilities of dot-matrix printers to form, with a double pass of the printhead, output in a range of five fonts varying from the futuristic DATARUN to the hand-writing style of PALACE SCRIPT. TASPRINT drives all dot-matrix printers with bit image graphics capabilities and can be used to print TASWORD text files. TASPRINT gives your output original ty and style!

TASPRINT ZX 48K Spectrum £9.90
TASPRINT Amstrad CPC 464 £9.90

TASWIDE

The Screen Stretcher

With this machine code utility you can write your own Basic programs that will, with normal PRINT statements, print onto the screen in the compact lettering used by TASWORD TWO. With TASWIDE you can double the information shown on the screen!

TASWIDE ZX 48K Spectrum £5.50

TASMAN PRINTER INTERFACE

Plug into your Spectrum and drive any printer fitted with the Centronics standard parallel interface. Supplied complete with ribbon cable and driving software. The user changeable interface software makes it easy to send control codes to your printer using the method so successfully pioneered with TASWORD TWO. The cassette also contains fast machine code high resolut on full width SCREEN COPY SOFTWARE for Epson, Mannesmann Tally, Seikosha, Shinwa, Star, and Tandy Colour Graphic (in colour!) printers. Compatible with microdrives and ZX Interface 1.

PRICE £39.90

TASMAN SOFTWARE

All prices include VAT and post and packaging.
Telephone orders: Leeds (0532) 438301

✱ Available from larger branches of Boots.

Tasman SOFTWARE

Springfield House, Hyde Terrace, Leeds LS2 9LN. Tel: (0532) 438301

If you do not want to cut this magazine just write your order and post to:
TASMAN SOFTWARE, dept. YC, Springfield House, Hyde Terrace, Leeds LS2 9LN.
I enclose a cheque/PO. made payable to Tasman Software Ltd. OR charge my ACCESS number

NAME _____

ADDRESS _____

VISA _____

COMPUTER	ITEM	PRICE
		£
		£
		£

Outside Europe add £1 for each item airmail £ _____ TOTAL £ _____

Send me the FREE Tasman brochure describing your products. tick here: ☐
I would like to know more about your programs for:
ZX Spectrum ☐ MSX ☐ Amstrad CPC 464 ☐

TOP ★ TIPS

CHARACTER SET

This short machine-code listing for the 48K Spectrum instantly redefines the complete Spectrum character set, giving any program that professional look (see below). It occupies a meagre 30 bytes but the character data it creates takes up over 760.

Type in the listing and then save it before running.

```
9900 CLEAR 64568
9910 FOR F=65339 TO 65365: READ
A: POKE F,A: NEXT F
9920 RANDOMIZE USR 65338
9930 DATA 33,0,61,17,57,252,1,0,
3,126,203,47,102,18,19,35,11,121
,176,32,244,33,57,251,34,54,92,2
01
```

PRINTER/PLOTTER

Owners of Commodore's 1520 printer/plotter know that it has the device number 6 instead of the usual number 4. This means the plotter cannot be used as a printer with software that uses a printer with device number 4. This short routine (below) allows the plotter to be addressed with a 4. It is activated by Sys 679.

```
1 REM BASIC LOADER TO ENABLE
2 REM 1520 PRINTER/PLOTTER TO USE
3 REM A DEVICE NUMBER OF 4
4 REM BY MARK HINO
5 REM ACTIVATE BY 'SYS 679
6 REM MUST BE RE-ACTIVATED AFTER
7 REM A WARM START
10 FORI=0TO22
20 READA:POKEI+679,A
30 NEXT
40 DATA 180,176,141,28,3,169,2,141,27,3,
96,3,72,165
50 DATA 186,201,4,208,4,169,6,133,186,10
4,48,76,94,243
```

FILL ROUTINE

Below is a machine-code fill routine. It is possible to break it with Symbol Shift and Stop. The routine also sometimes breaks itself to prevent a crash. When you Run the program, it asks you where to place the routine. Remember to put it above Ramtop.

Example: Putting the routine at 32000.

Type CLEAR 31999: RUN

Type 32000

SAVE example: (still 32000)

SAVE "fill"CODE 32000,95

LOAD example:

LOAD "fill"CODE 32000

Use the routine *this* way:

PLOT INVERSE l,x,y LET

L = USR routine address.

```
  5 LET l=0
 10 INPUT "Add: FOR l=0 TO 95
 20 READ a: POKE 64448+l,a
 25 LET l=l+1
 30 NEXT n
 35 IF l<>19419 THEN PRINT "Dat
a Error"
 40 DATA 237,91,126,92,213,205,
161,8,209,254,026,204,68,5,46,10
,42,[illegible],123,237,114,216,92,5,
66,75,205,176,04,71,4,72,120,7,1
5,203,203,71,192,203,199,65,16,1
6,205,119,75
 50 DATA 32,0,62,175,146,230,66
9,42,230,246,111,41,41,203,37,20
,[illegible],203,37,6,35,8,58,124,[illegible],139
,20,205,4,125,20,20,205,4,125,68
,20,205,4,125,21,21,205,4,125,20
,201,0
```

RESPONSE Frame

Do you have a problem related to your micro? Tim Hartnell will do his best to help. Please include only one question per letter and mark it "Response Frame". Alternatively, perhaps you have an idea you'd like to pass on to others. Why not write to us with your top tips?

RETAIL PROBLEM

■Please inform any software retailers reading this magazine that not *all* of their customers are budding pirates. On purchasing a tape for my ZX Spectrum, I found that it would not load. After several attempts using a variety of tape recorders to try and load it in, I decided to return it. The next morning I took it back complete with receipt of purchase. However, they insisted on trying it on their tape recorder and computer. To my surprise, it loaded. I was then asked to bring my computer into the centre. So, in the afternoon I took in my computer for them to try with their tape recorder. As I expected, it did not load. Then I was told that because the tape loaded on their machine there was nothing wrong with it and I could not get my money back. Please tell me, have I the right to my money back?

Greg Willis,
Yeovil.

OF COURSE you have. Under the Sale of Goods Act, the product sold has to be suitable for the purpose for which it was sold. Your tape plainly is not suitable.

You are far too patient. I would have refused to bring my computer into the store; created a scene; insisted that the manager be called, and demanded — in a very loud voice — that I get my money back.

Failing this, I would — as I have done in the past, I am not always a popular customer — called in the local Fair Trading officer: you can find out who this is from your council or citizen's advice centre. This threat invariably brings results. At the very least, they should have offered to exchange your tape for another one of the same game, and if this did not load, given you your money back without quibbling at all. Take this reply to the store, and demand your money back.

COPY DUMP

■I have an Alphacom 32 printer attached to my Spectrum. I have discovered that while I can dump hi-res pictures from the screen of nearly all commercial programs I own — such as *Valhalla* — I cannot do it with *The Hobbit*. Does this mean that the Alphacom is not totally compatible with the Spectrum? I only get rubbish when I try to Copy frames from *The Hobbit*. Why is this?

J M Holliday,
Shoeburyness,
Essex.

I RANG PHILIP Mitchell, the programmer who wrote *The Hobbit* and put your question to him. He said the fault does not lie in your printer. The program was written in such a way that it is not possible to access the Copy command while a hi-res picture is on the screen. However, you should have no trouble dumping text.

TUNEFUL BBC

■Recently I watched a commercial piece of software loading on a BBC Micro, and was amazed to hear a tune being played at the same time. I think this is a very good idea, as it is often so boring waiting for the program to load. Could you tell me how I could do this?

N A Holland,
Gendros,
Swansea

TO DO THIS, you have to be able to divert the CPU's interrupt calls to your own program, while the other loading continues. This means you have to go into machine code. Therefore, it is not a particularly easy thing to do.

WHICH MICRO?

■I am 16 years old and am thinking of buying my first computer. I am mainly thinking of the Commodore 64. The computer I buy will be used for playing games and doing some simple programming. I have read in many magazines, including *Your Computer*, comments that the 64 is difficult to program, and that an upgraded Basic should be bought for this purpose. Could you please tell me if the 64's Basic is adequate for my use, or should I buy a better Basic. If so, which one should I buy?

Vincent Judderham,
Mulbarton,
Norwich

IT IS UNREALISTIC to talk about buying an upgraded Basic for a computer you have not yet used. Many, many people — possibly the largest group of computer owners in the world — have found the 64's Basic more than adequate. It is not, however, an easy Basic to use, with extremely unfriendly graphics and sound commands. Despite this, extremely good results can be obtained.

If you are still in the beginner stages of using a computer, which I assume you are from your letter, you might be better served with the Spectrum, or Spectrum+, if you can accept the non-standard keyboard.

Finally, if you can afford it, I suggest you should seriously investigate the BBC Micro or Amstrad, as these give you access to computing power of a standard which the Spectrum and Commodore 64 do not possess.

SAVE MY WORK

■I have recently been working on a long, complex graphics program for the 48K Spectrum, but have hit upon disaster. I recorded over part of my only copy, and so I am now unable to use it. Every time I reach this spot in loading, I get a tape loading error. The last line loaded, 6316, is filled with question marks. Deleting this line does nothing. Is there any way I can save my work?

D Naylor,
Huby,
Leeds.

IT SEEMS that the simplest way to do it would be to LList the corrupted version, and type it in again. And, never only take one copy of important programs.

M/C SCROLL

■I am writing to you to inquire whether it would be possible for you to write me a small machine language routine which would scroll ASCII characters right and left, as in *Frogger*? This would be for my Atari 600XL.

S Hawkes,
West Bromwich,
West Midlands.

ROUTINES FOR scrolling vertically and horizontally appear from page 200 onwards of the book *Mastering the Atari* by Darryl Severn — ISBN 0 907563 88 0 — which costs £5.95.

MICROPRIDE LTD.

ORIC JOYSTICK

Suitable for use with Commodore 64, Vic 20 and Atari **£9.95**
Top Fire Button and Side Fire Button Fast Action
Interface for Oric 1/Atmos **£11.50**
Interface for Spectrum ZX81 **£7.95**

TRACKBALL

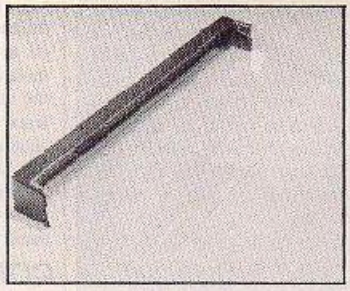
Improve your scores and skills with the Computek Trackball. Suitable for use with Commodore 64, Vic 20 and Atari **£17.95**
Interface for Oric 1/Atmos **£11.50**
Interface for Spectrum ZX81 **£7.95**

COMPUTEK JOYSTICKS

For use with the BBC Computer. Metal shaft, 2 fire buttons **£12.95**

PM C16 CASSETTE DATA UNIT

Designed for use with Commodore +4, Commodore 64 and Vic 20. This cassette unit is a device for storing and recalling computer programs on ordinary cassette tapes. It can be used for saving programs you have written and want to recall for later use. It can also be used to read pre-recorded programs that you have purchased. **£24.95**



DUST COVER

Clips onto the back of the Commodore 64. Pivits up to allow use of keyboard, fully moulded, clear plastic dust cover. **£7.95**

TRADE ENQUIRIES WELCOME

ORIC ATMOS **£125.95**

ORIC DISC DRIVE **£225.00**

ORIC PRINTER **£129.95**

ORIC MODEM AND INTERFACE **£99.95**

Please send me the following .....
I enclose my cheque/P.O. made payable to:

MICROPRIDE LTD for £.....

NAME .....

ADDRESS .....

.....

* ALL PRICES INCLUDE POSTAGE & PACKING *

MICROPRIDE LTD.
UNIT 16, SHIPYARD INDUSTRIAL ESTATE,
BRIGHTLINGSEA, ESSEX CO7 0AR. TEL ENQUIRIES 0206 304957

Sawmill

Nick Hockaday,
Shepherds Bush,
London W12.

SPECTRUM

A COMPANY WITH tree plantations connected by trails in timber country has given you a contract to supply their four sawmills with logs. You have hired three tree felling crews and you have a truck with which to transport crews or to collect and deliver logs. For safety reasons you cannot transport logs and crews together.

A crew that has been dropped at a plantation will work diligently while you use the truck for other business but the crew will not move to another plantation unless you take them there. You may call a crew to you by sounding a siren on your truck.

Your truck can carry a maximum of nine logs but if you attempt to overfill it, you will find that another log will fall off and be lost. The maximum speed of the truck is governed by the terrain and the log-load. Each sawmill shows in green the number of logs that it has in hand for processing, but if the number is less than 20 the display is white. These numbers will decrease periodically as the logs are processed but will increase if you make a delivery. Your score will show the total number of logs that you have delivered. If any sawmill runs out of logs then your contract is terminated and the game is over.

SOFTWARE *File*

Programs for Software File should be fairly compact and sent on a cassette. Please include clear instructions and say what computer it's for. We pay between £6 and £36 for programs published. They must be double-checked and submitted to *Your Computer* exclusively.

Operating instructions.
To move truck North press A.
To move truck South press Z.
To move truck West press O.
To move truck East press P.
To call crew press C.
To Quit press Q.
To Hold press H.
To Resume after hold re-press H.

To drop off a crew, stop the truck on the trail alongside the required position and press the appropriate direction key. Because of the bumpy ride you must not carry a crew if you are driving on a plantation. To pick up a log, press appropriate direction key. If you inadvertently drive into a tree, it will be up-rooted but will not be suitable as a log for a sawmill.

To deliver logs, stop the truck on the trail alongside any sawmill and press A. If the truck is on a trail you may call a nearby crew to you by pressing C.

To enter the program, first type and save program 1. Then enter and run the hex loader. Now enter program 2 and save it using:

SAVE "a" CODE 40672,404

Next enter and save the program 3 with:

SAVE "b" CODE 40672,1420

Delete the hex loader and enter and save program 4.

Program 1.

```
  2 REM "t"
  4 CLEAR 39999
  6 PRINT AT 7,0, PAPER 5; BRIG
HT 1;"TIMBER!.....© NICK HOCKADA
Y 1985"
  8 LOAD "a"CODE 40672,404
 10 RANDOMIZE USR 41000
 12 LOAD "b"CODE 40672,1420
 14 LOAD "c"
```

The hex loader.

```
 10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2
)-48-(7 AND h$(2)>"9")
 20 INPUT "Start ";s
 30 INPUT "Finish ";f
 40 FOR n=s TO f STEP 8
 50 IF tot=0: PRINT n;" ";
 60 INPUT h$: PRINT h$;
 70 LET x=0
 80 FOR b=1 TO LEN h$ STEP 2
 90 LET z=FN h(h$): LET tot=tot
+z
 100 POKE n+x,z
 110 LET h$=h$(3 TO ): LET x=x+1
 120 NEXT b
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN PRINT "input
error - try again": GO TO 50
 150 NEXT n
 160 REM enter STOP to stop
```

Program 2.

```
40672: BBF4BFBFBFBF4AEA = 1503
40680: EAEAEAE4BFBFBFBF = 1694
40688: 9DF49B9B9B9F48A8 = 1265
40696: A8A8A8E49B9B9B9F = 1356
40704: B9F49DDDDDDD48CC = 1525
40712: CCCCCCC49DDDDDDF = 1630
40720: 9DF4444444444444 = 809
40728: 444444444444449F = 635
40736: B9F4AEAAAAAE4AAA = 1361
40744: AAAAAAAAAE4BF49F = 1332
40752: 9DD48A8ECECE48CC = 1337
40760: CCECCECECE49F49D = 1532
40768: 44448CEC8C8E4444 = 930
40776: A8AE8C8C8E49F444 = 1149
40784: AAE4A8E7778E4BF4 = 1377
40792: 8ECE777A8E49F4AE = 1222
40800: 8CE48CC000BC49F4 = 1157
40808: 8C8C111BCC49D4BE = 952
40816: ABE44446664449F4 = 1021
40824: 444466644444448E = 684
40832: 8CE4AAAAAAAE49F4 = 1369
40840: BBF4AEAEAEAE4A8E = 1343
40848: A8E48ECCCCCC49D4 = 1435
40856: 9DF48A8A848E48EC = 1265
40864: 8CC48E4444444444 = 818
40872: 49F48ECCCCCE48AE = 1319
40880: 44448E4AAAAAAAAE = 1036
40888: 49F48AE7778E48EC = 1255
40896: BBF48E48ECCCCECE = 1497
40904: 49D48CC3338C48AE = 1057
40912: 9DF48E48E7778E8E = 1249
40920: 4444444666444BCC = 720
40928: B9F48C48C2228C8C = 1149
40936: 4AAE4BBBBBBF4444 = 1024
40944: 9DF4444446664444 = 845
40952: 48EC49DDDDDD4BBF = 1310
40960: B9BBBF4AAAAAE4AA = 1375
40968: A8AE4444444449FD = 940
40976: 9FDFDF48ECECE48E = 1519
40984: CECE4BBBBBBBB9BF = 1424
40992: 9D9D9D48C8C8C48C = 1279
41000: 8C8C49DDDDDDDDDD = 1458
41008: 11409C21DF9E23D5 = 899
41016: E51130A0AFED52E1 = 1173
41024: D1D00602AFED6FCB = 1151
41032: 5F2806E607F6A018 = 808
41040: 1DCB572813E60328 = 651
41048: 07FE022807AF180E = 523
41056: 3E40180A3E601806 = 348
41064: E6033C07C6201213 = 567
41072: 10D218C200 = 444
```

Program 3.

```
40672: 00385C7C38101000 = 360
40680: 0000113377FF99FF = 850
40688: 0000000007E7E00 = 252
40696: 00003C3C3C3C0000 = 240
40704: D5E5C5F5110F0021 = 949
40712: 800ACDB503F1C1E1 = 1186
40720: D1C9D5E5C5F5110F = 1326
40728: 00210002CDB503F1 = 665
40736: C1E1D1C9C5E5D544 = 1535
40744: 4D114044A7ED5277 = 831
40752: 606911409DED5260 = 854
40760: 6911405C380F1140 = 430
40768: 9EED526069114055 = 044
40776: 380311404EA7ED52 = 704
40784: D106081A77132410 = 439
40792: FAE1C1C9E5151D6B = 1255
40800: 260029292929295A = 333
40808: 16001911409C19EB = 544
40816: E1C9C57D93330027B = 1068
40824: 954F7C9230027A94 = 818
40832: 813DC1C9E5D51140 = 1107
40840: 44373FED52CBB6D1 = 1099
40848: E1C9E5D511404437 = 1072
40856: 3FED52CBF6D1E1C9 = 1466
40864: D5C5F5ED5B94A4CD = 1500
40872: 5C9FED5396A41A32 = 961
40880: 9CA4ED5B98A4CD5C = 1261
40888: 9FED539AA41A329D = 1030
40896: A4ED5B7CA4AF2A7E = 1123
40904: A4ED522002CBC7A7 = 1086
40912: 2A80A4ED522002CB = 890
40920: CFA72A82A4ED5220 = 1061
40928: 02CBD7329FA4F1C1 = 1227
40936: D1FE012A94A4C8FE = 1272
40944: 022A96A4C8FE032A = 857
40952: 98A4C8FE042A9AA4 = 1134
40960: C8FE052A9CA4C32A = 1063
40968: 9EA4C9CBF4CBACCB = 1548
40976: E454CBA54D3E04CD = 1028
40984: A09F7211F89E73CD = 1181
40992: 249F3E02CDA09F71 = 896
41000: 11003D3E28CB7928 = 544
41008: 023E30CD249F3E03 = 577
41016: CDA09F227CA4C93A = 1105
41024: 7AA4FE0121500028 = 694
41032: 18FE02213E002B11 = 432
41040: FE03213000280AFE = 642
41048: 04212600280321 1E = 181
41056: 00228EA4AFCB1CCB = 949
41064: 1D2290A421280022 = 478
41072: 92A46F672275A432 = 889
41080: 78A42284A42286A4 = 949
41088: 2288A4228AA43C32 = 780
41096: 74A43279A43C3C32 = 785
41104: 9EA4210A09227CA4 = 696
41112: 227EA42280A42282 = 814
```

(continued on next page)

(continued from previous page)

```
41120: A4213200110A0022 = 308
41128: 6CA419226EA41922 = 664
41136: 70A4192272A42140 = 710
41144: 9C2277A411E09EAF = 1047
41152: E5ED52E1302E7ECB = 1196
41160: 7F2B10E607F6A077 = 945
41168: 11E09E3E30CD249F = 909
41176: 2318E1CB77280AE6 = 886
41184: E07711003D3E2818 = 547
41192: ECCB6F28EB11E89F = 1232
41200: 3E681BE121689D3E = 771
41208: 707711F89E3E68CD = 1025
41216: 249FC9ED5E7CA4CD = 1217
41224: 5C9FEB0601CB7E28 = 862
41232: 0206053A7BA4B047 = 557
41240: 2105001101001910 = 97
41248: FD228CA406032100 = 633
41256: 0011000223E5ED52 = 602
41264: E138F910F12183A4 = 1115
41272: 0604235E23561372 = 393
41280: 2B732310F5AF2A84 = 803
41288: A4ED5B8CA4ED52D2 = 1325
41296: 73A2AF2A86A4ED5B = 1120
41304: 8EA4ED52D235A2AF = 1225
41312: 2A88A4ED5B90A4ED = 1215
41320: 52D2F6A1AF2A8AA4 = 1218
41328: ED5B92A4ED5238AC = 1185
41336: 676F228AA41179A4 = 852
41344: 1A474FFE032001AF = 641
41352: 3C12217CA4232310 = 485
41360: FC5E2356D5CD5C9F = 1136
41368: 1AD16B62CB7FCA03 = 975
41376: A1E606280AFE0228 = 743
41384: 08FE0428061C1C1D = 397
41392: 151414152294A4ED = 665
41400: 5398A4D5CD5C9F1A = 1094
41408: D1E618C203A1217C = 976
41416: A441232310FC7323 = 717
41424: 723E02CDA09FCB9E = 1063
41432: CBF6CB6E11003D28 = 880
41440: 0311F09E3E30CD24 = 769
41448: 9F3E04CDA09FCBDE = 1174
41456: CD929FC303A1676F = 1083
41464: 2288A42A77A45747 = 817
41472: 3A785C5F1911E09E = 789
41480: A7E5ED52E1380511 = 1018
41488: A002ED522277A4E6 = 1028
41496: 0328010478F6C047 = 677
41504: 7EE6F990200CCBEE = 1234
41512: CBB611E09E3E30CD = 1099
41520: 249FC303A1676F22 = 802
41528: 86A43A74A4474F21 = 819
41536: 6AA4232310FC5E23 = 737
41544: 561B722B737AB320 = 718
41552: 10064021C05A3610 = 471
41560: 2310FB3E0332815C = 638
41568: C9413E078032815C = 734
41576: 79FE042001AF3C32 = 697
41584: 74A4C9676F2284A4 = 1025
41592: ED5B7CA43A005C47 = 837
41600: 3A045CB8380178FE = 769
41608: 4FCA2BA3FE5ACA27 = 1072
41616: A3FE41CA29A3FE50 = 1222
41624: CA25A3FE4328 1AFE = 1043
41632: 512309FE48C203A1 = 814
41640: 3E0218023E01060A = 169
41648: CD129F10FB32815C = 920
41656: C93A9EA4FE03287D = 1003
41664: 3A7BA4A72077D5CD = 1081
41672: 5C9FEBCB7ED1206D = 1165
41680: 2A7EA4CD729F470E = 895
41688: 012A80A4CD729FB8 = 997
41696: 3002470C2A82A4CD = 674
41704: 729FB830020E0306 = 530
41712: 0ACD009FCD129F10 = 772
41720: F8D5217CA4412323 = 917
41728: 10FC5E2356E5CD5C = 1009
41736: 9FEBCB9ECDB49FE1 = 1476
41744: D1722B73CD5C9FEB = 1172
41752: CD929F219EA4343E = 979
41760: 0C32815CC9141D1C = 561
41768: 1C1D1415AFBA280D = 512
41776: BB280A3E21BA2805 = 563
41784: 3E16BB2006CD009F = 673
41792: C303A12A7CA42294 = 871
41800: A4ED5398A43E05CD = 1072
41808: A09F7CE688FE8828 = 1239
41816: 177CA72813E6E0FE = 1081
41824: 20203E7DE6E0FE60 = 1055
41832: 20063A7BA4A72006 = 588
41840: CD009FC303A14F7C = 926
41848: 0FE607473C3C3C32 = 553
41856: 815C216AA4232310 = 610
41864: FC78327BA45E2356 = 924
41872: EB09EB722E732A75 = 910
41880: A4092275A4CD129F = 870
41888: C93A9EA4A72846CB = 1061
41896: 7C28423E06CDA09F = 822
41904: 444D3D3DCDA09FCB = 994
41912: DECD929F3D3DCDA0 = 1219
41920: 9F0D2003CDB49F3C = 763
41928: CDA09FCB50280522 = 886
41936: 82A4180CCB482805 = 650
41944: 2280A4180322 7EA4 = 677
41952: 219EA4353E0C3281 = 661
41960: 5CCD129FC97CE6E0 = 1253
41968: FEA0200B0630CD0B = 727
41976: A0CD129FC303A1FE = 1155
41984: E0201F0630CD0DA0 = 719
41992: 3A7BA43CFE0A2006 = 707
42000: CD009FC303A1327B = 896
42008: A43E0C32815CCD12 = 737
42016: 9FC9CB7C280B0630 = 792
42024: CD0FA0CD129FC303 = 960
42032: A13A9EA4A7200B06 = 757
42040: 28CD0FA0CD129FC3 = 997
42048: 03A1E53E06CDA09F = 985
42056: 7CE1F50668CD0FA0 = 1084
42064: F1CB572803228 2A4 = 902
42072: CB4F2303228 0A4CB = 854
42080: 472803227EA4CD12 = 661
42088: 9FC303A100 = 518
```

Program 4.

```
  2 REM "c"
 10 IF a>999 THEN LET a=999
 12 LET i$=STR$ a
 14 IF LEN i$<3 THEN LET i$=" "+i$: GO TO 14
 15 LET p=4: IF a<20 THEN LET p=7
 18 RETURN
 20 LET a=PEEK 42092+256*PEEK 42093
 22 GO SUB 10
 24 PRINT AT 7,7; PAPER p; BRIGHT 1;i$
 26 RETURN
 30 LET a=PEEK 42094+256*PEEK 42095
 32 GO SUB 10
 34 PRINT AT 7,20; PAPER p; BRIGHT 1;i$
 36 RETURN
 40 LET a=PEEK 42096+256*PEEK 42097
 42 GO SUB 10
 44 PRINT AT 13,9; PAPER p; BRIGHT 1;i$
 46 RETURN
 50 LET a=PEEK 42098+256*PEEK 42099
 52 GO SUB 10
 54 PRINT AT 13,23; PAPER p; BRIGHT 1;i$
 56 RETURN
 70 LET w=PEEK 42107: LET c=PEEK 42142: LET l=PEEK 42106
 72 LET i$="LOAD   EMPTY *LEVEL "
 74 IF w=0 THEN GO TO 80
 76 LET i$(8)=STR$ w: IF w=1 THEN LET i$(8 TO 12)="LOG  ": GO TO 86
 78 LET i$(8 TO 12)="LOGS ": GO TO 86
 80 IF c=0 THEN GO TO 86
 82 LET i$(8)=STR$ c: IF c=1 THEN LET i$(8 TO 12)="CREW ": GO TO 86
 84 LET i$(8 TO 12)="CREWS"
 86 PRINT AT 21,0; PAPER 4; BRIGHT 1;i$;l
 88 RETURN
100 GO SUB 70
102 LET s=PEEK 42101+256*PEEK 42102: PRINT AT 21,21; PAPER 4; BRIGHT 1;"*SCORE    ": PRINT AT 21,32-LEN STR$ s; PAPER 4; BRIGHT 1;s
104 IF j=4 THEN GO SUB 20: GO TO 114
106 IF j=5 THEN GO SUB 30: GO TO 114
108 IF j=6 THEN GO SUB 40: GO TO 114
110 IF j=7 THEN GO SUB 50: GO TO 114
112 GO SUB 20: GO SUB 30: GO SUB 40: GO SUB 50
114 RANDOMIZE USR 41219
200 LET j=PEEK 23551
202 IF j=8 THEN GO SUB 20: GO TO 114
204 IF j=9 THEN GO SUB 30: GO TO 114
206 IF j=10 THEN GO SUB 40: GO TO 114
208 IF j=11 THEN GO SUB 50: GO TO 114
210 IF j=12 THEN GO SUB 70: GO TO 114
212 IF j=1 THEN GO TO 610
214 IF j=2 THEN GO TO 300
216 IF j=3 THEN GO TO 350
218 GO TO 100
300 PRINT AT 21,0; PAPER 4; BRIGHT 1;"NOW PRESS h"
302 IF INKEY$<>"" THEN GO TO 302
304 IF INKEY$="" THEN GO TO 304
306 LET i$=INKEY$: IF i$<>"h" THEN GO TO 302
308 PRINT AT 21,0; PAPER 4; BRIGHT 1;" ";TAB 12;" "
310 IF INKEY$<>"" THEN GO TO 310
312 GO SUB 70: GO TO 114
350 BORDER 2: LET c=PEEK 42100
352 LET a=7: LET b=7: IF c=2 THEN LET b=20
354 IF c=0 THEN LET a=15: LET b=9
356 IF c=4 THEN LET a=13: LET b=23
358 PRINT AT a,b; PAPER 2; INK 7; BRIGHT 1; FLASH 1;"*": PRINT PAPER 7; BRIGHT 1;" 0"
360 PRINT AT 21,0; PAPER 4; BRIGHT 1;"* GAME OVER"
362 FOR n=20 TO -10 STEP -1: BEEP .02,n: NEXT n
364 PRINT AT 3,3; PAPER 4; BRIGHT 1;"* FOR NEW GAME....PRESS y *"
366 IF INKEY$<>"" THEN GO TO 366
368 IF INKEY$="" THEN GO TO 368
370 LET i$=INKEY$: IF i$<>"y" THEN GO TO 366
372 GO TO 610
600 PAPER 6: INK 0: CLS : PRINT AT 7,12; PAPER 5;"TIMBER!"
602 PRINT AT 9,6; PAPER 5;"© NICK HOCKADAY 1985"
604 PRINT AT 19,8; "NOW PRESS ENTER"
606 IF INKEY$<>"" THEN GO TO 606
608 IF INKEY$="" THEN GO TO 608
800 CLS : PRINT AT 3,0;"There are 5 levels ranging from level 1 ,the easiest,to level 5, the most difficult."
802 PRINT AT 7,0;"WHICH LEVEL DO YOU WISH TO PLAY ON?"
804 PRINT AT 11,6;"PRESS 1,2,3, 4 or 5"
806 IF INKEY$<>"" THEN GO TO 806
808 IF INKEY$="" THEN GO TO 808
810 LET i$=INKEY$: IF CODE i$<49 OR CODE i$>53 THEN GO TO 808
812 LET c=VAL i$: POKE 42106,c
814 CLS : LET j=0: PRINT AT 3,2;"YOU HAVE SELECTED LEVEL ";c
816 PRINT AT 7,0;"Before you press ENTER to play, remember that at the start, you have three crews on your truck."
818 PRINT AT 11,0;"Crew positions are always shown bright."
820 PRINT AT 17,3;"NOW PRESS ENTER TO PLAY"
822 IF INKEY$<>"" THEN GO TO 822
824 IF INKEY$="" THEN GO TO 824
826 CLS : RANDOMIZE USR 41023: GO TO 100
```

Mutant's Revenge

Martin Hargreaves,
Allerton,
Bradford.

ZX-81

MUTANT'S REVENGE IS for the 16K ZX-81. The principle of the game centres around the arcade classic Defender except you are one of the mutants.

The object is to guide your mutant onto a humanoid, capture it and take it skywards. Sounds easy? As you will find out, it is very

hard and will take some mastering.

The program itself has everything the average computer games freak wants. Fast, original, good graphics, Hall of Fame, 100 skill levels etc.

Line 1 should contain at least 94 full stops. On line 1530 it mentions 12* graphic "G s". This means that you must type in the graphic "G" character 12 times.

When it has all been keyed in you must save before running. To save type Goto 1890. This saves the program with the name "Mut" and runs automatically on loading. There is a variable in this program called At, this should not be confused with the keyword At.

When you run this program your ZX-81 will move into Fast mode to load some machine code. You do not need to type in hex or decimal codes blindly as the program has it all in memory at line 20 and a built-in interpreter. As soon as the machine code is loaded it is executed twice using Rand USR 16514.

You will then be asked at what speed you wish to play — 0 to 9. Note the absence of an input sign to avoid data entry errors. Then you are asked for the fuel consumption rate, again, in a range of 0 to 9 and no input sign.

When both the skill levels have been entered a neat little routine will display what keys are needed to control your mutant. This gives you time to fumble about and get your fingers over the right keys, which are:

C = up.
A = down.
O = left — thrust.
P = right — thrust.
I = hyperspace.

Your first job is to capture a humanoid "o". These are randomly scattered across the landscape. Your mutant is situated at the far left-hand side of the screen steadily moving right. The O and P keys serve as thrust and reverse keys. This means that if you press O your mutant will keep moving left unless told otherwise. These features make the mutant more manoeuvrable as he can now move in diagonals. If he hits the far left/right hands of the screen don't worry as he will re-appear on the other side.

When you hit a humanoid you will be awarded 10 points — this will be shown on the "score" gauge and the humanoid gauge will decrease by one.

Once you have captured a humanoid phase two begins. This involves taking the humanoid skywards. Your mutant moves up automatically so it is just a job of avoiding pyrenoids and the gate. The gate is a hole situated in the grey bar at the top of the screen which moves from side to side. Pyrenoids are asterisks which float in the sky — contact with one will prove fatal.

If you manage to carry your humanoid through the gate you are awarded a mystery amount of points and you will return to the left of the screen to try and capture another.

If all the humanoids have been captured you are said to have completed an attack wave and a bonus of 30 points will be added to your score. When all humanoids have been captured you will go on to the attack wave sequence. Sometimes, however, your mutant will return to the left of the screen even though there are no corresponding humanoids. In this case just move through the gate and move to the top of the screen.

If you score 500, 600 or 800 then you will be awarded an extra man and the game speed will hot up. The screen will clear and another random landscape will be drawn and play will continue.

This program is fitted with a special key which, when pressed, shoots you out of trouble and throws your mutant into a random position on the screen.

```
   1 REM .....94 FULL STOPS ....

  10 FAST
  20 LET A$="3506CD93403E80CD934
0010000CD7508C32F0C400E150620502
377CDD5401520F80E6C0C8012100007FC
DD5401D20F8C10D5C2877CDD5401520F
85F78FE0B387B055EC5012100ED42777C
DD5401D20F7C10D1EC5F53EC03D20FDF
1C9"
  30 LET MC=16514
  40 FOR I=1 TO LEN A$ STEP 2
  50 POKE MC,16+(CODE A$(I)-28)+
CODE A$(I+1)-28
  60 LET MC=MC+1
  70 NEXT I
  80 SLOW
  90 POKE 16535,23
 100 POKE 16575,9
 110 POKE 16599,190
 120 DIM L(10)
 130 DIM K$(2)
 140 DIM N$(11,20)
 150 FOR F=1 TO 10
 160 LET N$(F)="(C)  M.P.H SOFTW
ARE."
 170 NEXT F
 180 LET N$(11)="[redacted]"
 190 RAND USR 16514
 200 POKE 16418,2
 210 RAND USR 16514
 220 REM END OF MACHINE CODE.
 230 REM MUTANT'S ENCOUNTER [redacted]
M.P.HARGREAVES 1985",23
 240 PRINT AT 5,5;"INPUT SPEED [redacted]
0 TO 9";AT 7,9;"0=EASY 9=HARD"
 250 LET K$(1)=INKEY$
 260 IF K$(1)>"9" OR K$(1)<"0" T
HEN GOTO 250
 270 LET SP=CODE K$(1)-28
 280 LET SP=SP+5
 290 LET SP=SP*10
 300 PRINT AT 10,0;"INPUT FUEL C
ONSUMPTION (0 TO 9)";AT 12,6;"0=
EASY 9=HARD"
 310 LET K$(2)=INKEY$
 320 IF K$(2)>"9" OR K$(2)<"0" T
HEN GOTO 310
 330 LET FC=CODE K$(2)-28
 340 LET FC=FC+1
 350 LET FC=FC/10
 360 GOSUB 1820
 370 LET A$="[redacted]
[redacted]"
 380 LET S=0
 390 LET AT=1
 400 LET L1=5
 410 LET B$="[redacted]"
 420 FOR F=5 TO 2
 430 PRINT AT F,0;F$;AT F+19,0;A
$
 440 NEXT F
 450 PRINT AT 0,13;CHR$ 154;AT 6
,7;"""Q"" = UP";AT 8,7;""""A"" =
DOWN";AT 10,7;""""O"" = LEFT";AT
12,7;""""P"" = RIGHT";AT 14,7;""
I"" = HYPERSPACE";AT 1,2;"M U T
A N T S  S E V E N S E";AT 20,8;
"PRESS  A  TO START"
 460 IF INKEY$="" THEN GOTO 460
 470 RAND USR 16514
 480 POKE 16418,2
 490 FAST
 500 LET D=14
 510 LET HU=0
 520 LET H=15
 530 LET FU=31
 540 FOR F=0 TO 31
 550 IF F>2 AND F<28 THEN PRINT
AT INT (RND*H-3),F,CHR$ 151
 560 PRINT AT 2,F;CHR$ 138;AT 23
,F;CHR$ 132
 570 LET I=INT (RND*30)
 580 LET H=H+(I>15 AND H<20)-(I<
=15 AND H>6)
 590 IF I>15 THEN PRINT AT H,F;C
HR$ 6
 600 IF I<=15 THEN PRINT AT H+1,
F;CHR$ 134
 610 IF F>28 AND HU=0 OR I>28 OR
 I<3 AND F>1 AND F<31 AND HU>0 T
HEN GOSUB 640
 620 NEXT F
 630 GOTO 670
 640 PRINT AT 21,HU+1;CHR$ 180;T
AB HU-1;CHR$ 5;AT H-1,F;CHR$ 180
 TAB F;CHR$ 8
 650 LET HU=HU+1
 660 RETURN
 670 FOR F=11 TO S+LI STEP 2
 680 PRINT AT 22,F;CHR$ 192
 690 NEXT F
 700 SLOW
 710 PRINT AT 22,20;"SCORE=";S
 720 LET A=3+INT (RND*8)
 730 LET CA=0
 740 LET B=0
 750 FOR B=B TO 31 STEP SP
 760 GOSUB 870
 770 IF INKEY$="O" THEN GOTO 810
 780 NEXT B
 790 LET B=0
 800 GOTO 750
 810 FOR B=B TO 0 STEP -SP
 820 GOSUB 870
 830 IF INKEY$="P" THEN GOTO 780
 840 NEXT B
 850 LET B=31
 860 GOTO 810
 870 PRINT AT A,B;
 880 LET P=PEEK (PEEK 16396+PEEK
 16399*256
 890 IF FU<=0 OR P>5 AND P<152 A
ND P<>128 THEN GOTO 1280
 900 IF P=128 THEN GOTO 970
 910 IF HU=0 AND A=0 THEN GOTO 1
140
 920 PRINT CHR$ 192,AT A,B;B$;AT
 20,FU;CHR$ 160
 930 LET FU=FU-FC
 940 LET A=A+(INKEY$="A" AND A<1
9)-(INKEY$="Q" AND CA=0)
 950 IF INKEY$="I" THEN GOSUB 10
90
 960 RETURN
 970 LET HU=HU-1
 980 GOSUB 1120
 990 LET CA=1
1000 LET S=S+10
1010 PRINT AT A,B;"[redacted]";AT 21,HU+
1;B$;TAB HU+1;B$;AT 22,26;S;AT A
,B;B$;AT A,B+1;B$
1020 LET A=A-1
1030 FOR A=A TO 0 STEP -SP
1040 GOSUB 870
1050 LET B=B+(INKEY$="P" AND B<3
1)-(INKEY$="O" AND B>0)
1060 PRINT AT 2,D;"[redacted]";AT A,
B;CHR$ 180;AT A,B;B$
1070 LET D=D+(D<0)-(D>0)
1080 IF D=0 THEN GOSUB 1120
1090 NEXT A
1100 LET S=S+5+INT (RND*15)
1110 GOTO 710
1120 LET G=INT (RND*27)
1130 RETURN
1140 RAND USR 16514
1150 PRINT AT 10,3;"ATTACK WAVE
";AT;"[redacted]";AT 12,10;"BON
US = 30"
1160 FOR F=1 TO 40
1170 NEXT F
1180 LET S=S+30
1190 IF S>800 OR S>500 AND S<600
 THEN GOSUB 1220
1200 LET AT=AT+1
1210 GOTO 470
1220 FOR F=0 TO 40
1230 PRINT AT 14,10;"BONUS LIFE"
;AT 14,10;"[redacted]"
1240 NEXT F
1250 LET LI=LI+2
1260 LET FC=FC+0.25
1270 RETURN
1280 LET LI=LI-2
1290 FOR F=1 TO 11
1300 PRINT AT F+1,0;N$(11,F
1310 NEXT F
1320 PRINT AT 22,LI+11;B$
1330 FOR F=2 TO 12
1340 PRINT AT F,0;B$;AT 2,0;CHR$
 138
1350 NEXT F
1360 IF LI=0 THEN GOTO 1430
1370 IF CA=1 THEN GOTO 930
1380 GOTO 630
1390 PRINT AT A,B;B$
1400 LET A=3+INT (RND*4)
1410 LET B=INT (RND*31)
1420 RETURN
1430 PRINT AT 10,11;"[redacted]"
1440 FOR F=0 TO 40
1450 NEXT F
1460 RAND USR 16514
1470 POKE 16418,2
1480 FOR J=1 TO 10
1490 IF S>=L(J) AND S>0 THEN GOS
UB 1780
1500 IF S>=L(J) AND S>0 THEN GOT
O 1710
1510 NEXT J
1520 CLS
1530 PRINT AT 2,9;"HALL OF FAME"
;TAB 9;"12*GRAPHIC G";,,"PLACE";
TAB 10;"NAME";TAB 27;"SCORE";AT
18,12;"""1"" TO PLAY";TAB 3;""2
"" TO RESET HIGH SCORES";TAB 3;"
""3"" TO CHANGE DIFFICULTY"
1540 FOR J=1 TO 10
1550 PRINT AT J+6,2,J;TAB 6;N$(J
);AT J+6,28;L(J)
1560 NEXT J
1570 FOR F=0 TO 63
1580 PLOT F,8
1590 PLOT F,31
1600 PLOT F,34
1610 NEXT F
1620 FOR F=8 TO 34
1630 PLOT 11,F
1640 PLOT 52,F
1650 NEXT F
1660 PRINT AT 0,0;"ON ATTACK WAV
E ";AT;" YOUR SCORE=";S
1670 IF INKEY$="1" THEN GOTO 360
1680 IF INKEY$="2" THEN GOTO 120
1690 IF INKEY$="3" THEN GOTO 210
```

(continued on next page)

Grid Challenge

John Consadine,
Swanland,
North Humberside.

CBM-64

IN GRID CHALLENGE you are shown a grid of 390 slots each referenced by a letter and number. Each slot is filled with one of up to 39 different characters randomly chosen and then hidden from your view.

The object of the game is to pick two matching characters. If you are successful you are allowed another go. This continues until you make an error when it is the computer's turn. It is allowed only one turn as it gets the answer right every time.

To give you a fighting chance, if you type Peek you will be allowed a quick look at the grid at any time but a check is kept on how often you do this. Also typing Score will show your total successes so far.

The duration of the game may be shortened if required by reducing the values of TP and TC in lines 10000-10010. The harder the game you choose the more different characters are used. Your concentration will be pushed to the limit!

(continued from previous page)

```
1700 GOTO 1670
1710 GOSUB 1830
1720 PRINT AT 8,0,"WELL DONE;PLE
ASE ENTER YOUR NAME";AT 10,3;"NO
 MORE THAN 20 LETTERS."
1730 INPUT N$(J)
1750 LET L(J)=S
1760 GOSUB 1830
1770 GOTO 1520
1780 FOR P=9 TO J STEP -1
1790 LET L(P+1)=L(P)
1800 LET N$(P+1)=N$(P)
1810 NEXT P
1820 RETURN
1830 FOR F=0 TO 23
1840 SCROLL
1850 PRINT TAB 31;
1860 NEXT F
1870 CLS
1880 RETURN
1890 SAVE "MU
1900 RUN
```

```
10 REM***************
20 REM GRID CHALLENGE
30 REM
40 REM J.CONSADINE
50 REM   15/8/84
60 REM***************
100 DIM(27,16),A$(27,15),FL(27,16)
110 XD$="D":FORX=1TO25:CD$=CD$+XD$:NEXT
120 XR$="R":FORX=1TO39:CR$=CR$+XR$:NEXT
130 EE$=" ":FORX=1TO88:E$=E$+EE$:NEXT:E$="E"+E$+"R"
132 AA$="1234567890123456789012345612345678901234567890"
134 BB$="1234567891234567890000000000123456789012345678901"
136 CC$="1234567890000000000000000000123456789012345678901"
140 DD$="*%%%
```

377B in line 10 with # 377C. Run the program again. If "Out of data in 10" appears on the screen then Goto paragraph 5.

4 If an error was logged in para 2, you have missed out some data statements in the program. If no error was logged in para 3, you have somehow typed in too much data.

5 Amend line 10 to read as per the listing and type:

CSAVE"FRAGG CHASE",A#2F05,E#377B,S,AUTO

6 Start cassette machine recording, wait 10 seconds, press Return.

7 When program is saved type:

CLOAD"FRAGG CHASE",S,V; and press Return

8 Rewind cassette and press play. If any errors are reported then repeat from para 5.

```
 10 FORN=#2F05TO#377E:READD:POKEN,D:NEXTN
 100 DATA234,32,178,50,32,9,49,234,234,32,159,54,32,20
5,51,32,18,49,32
 110 DATA1,48,234,32,178,50,32,167,50,32,30,55,234,234
,32,167,50,32,181,54
 120 DATA32,159,54,32,20,48,32,45,51,234,32,79,49,32,2
16,52,234,234,32,135
 130 DATA49,32,9,49,32,45,50,32,238,52,32,135,50,234,3
2,61,53,32,14,55
 140 DATA169,1,141,79,2,141,78,2,234,234,32,131,51,32,
27,51,32,187,50,32
 150 DATA155,51,32,53,52,234,32,9,51,32,172,53,234,234
,32,214,53,169,0,141
 160 DATA108,2,32,131,51,32,27,51,32,187,50,32,155,51,
32,53,52,234,32,9
 170 DATA51,32,172,53,234,234,32,62,55,32,46,55,32,108
,55,234,234,234,234,234
 180 DATA234,234,173,12,151,201,1,208,6,32,103,52,76,3
8,47,234,234,234,162,0
 190 DATA189,0,150,141,1,151,189,1,150,141,2,151,142,1
4,151,32,161,49,32,225
 200 DATA49,173,152,49,141,220,47,173,153,49,141,221,4
7,169,42,205,83,187,208,5
 210 DATA169,2,141,12,151,234,174,14,151,232,232,236,9
,151,208,200,173,12,151
 220 DATA201,2,208,6,32,203,250,76,30,47,234,76,94,47,
169,127,141,12,2,169,0
 230 DATA141,0,4,141,1,4,169,10,141,106,2,96,169,147,1
62,0,157,168,187,232
 240 DATA224,240,208,248,162,0,157,152,188,232,224,240
,208,248,162,0,157,136,189
 250 DATA232,224,240,208,248,162,0,157,120,190,232,224
,240,208,248,162,0,157,104
 260 DATA191,232,224,120,208,248,169,22,162,3,157,72,1
88
 265 DATA232,224,37,208,248,162,3
 270 DATA157,112,188,232,224,37,208,248,162,3,157,152,
188,232,224,37,208,248,162
 280 DATA3,157,192,188,232,224,37,208,248,162,3,157,23
2,188,232,224,37,208,248
 290 DATA162,3,157,16,189,232,224,37,208,248,162,3,157
,56,189,232
 300 DATA224,37,208,248,162,3,157,96,189,232,224,37,20
8,248,162,3,157,136
 305 DATA189,232,224,37,208,248,162,3,157,176
 310 DATA189,232,224,37,208,248,162,3,157,216,189,232,
224,37,208,248,162,3,157,0
 320 DATA190,232,224,37,208,248,162,3,157,40,190,232,2
24,37,208,248,162,3,157,80
 330 DATA190,232,224,37,208,248,162,3,157,120,190,232,
224,37,208,248,162,3,157
 340 DATA160,190,232,224,37,208,248,162,3,157,200,190,
232,224,37,208,248,162,3
 350 DATA157,240,190,232,224,37,208,248,162,3,157,24,1
91,232,224,37,200,240,96
 360 DATA169,0,141,225,2,32,16,242,96,169,12,141,80,18
1,141,81,181,141,84,181
 370 DATA141,89,181,141,92,181,169,18,141,82,181,141,8
5,181,141,86,181
 380 DATA141,88,181,141,93,181,141,94,181,169,45,141,8
3,181,141,91
 390 DATA181,169,0,141,87,181,169,63,141,90,181,169,51
,141,95,181,96,169,83,141
 400 DATA212,187,141,230,187,169,67,141,213,187,141,23
1,187,169,79,141,214,187
 410 DATA141,232,187,169,82,141,215,187,141,233,187,16
9
 420 DATA69,141,216,187,141,234,187,169,72,141,227,187
,169,73,141,228,187,169,05
 430 DATA141,229,187,96,162,140,142,0,151,32,161,49,32
,172,49,32,225
 440 DATA49,169,150,141,171,188,174,0,151,202,208,233,
96,169
 450 DATA168,141,152,49,169,107,141,153,49,96,32,16,50
,173,108,239,56,201,4,176
 460 DATA2,105,4,56,201,38,144,5,233,34,76,185,49,141,
2,151,32,16,50,173
 470 DATA109,239,56,201,5,176,2,105,5,56,201,24,144,5,
233,17,76,211,49,141
 480 DATA1,151,96,173,1,151,162,39,24,109,1,151,176,18
,202,208,247,24,105,127
 490 DATA176,16,24,109,2,151,176,16,141,152,49,96,238,
153,49,76,236,49,238,153
 500 DATA49,76,244,49,238,153,49,76,250,49,174,3,151,1
72,4,151,140,176,49,200
 510 DATA208,1,232,140,4,151,142,3,151,142,177,49,140,
202,49,142,203,49,96,32
 520 DATA99,50,160,76,162,76,185,1,150,93,3,150,208,26
,185,0,150,93,2,150
 530 DATA208,18,142,5,151,140,7,151,32,101,50,174,5,15
1,172,7,151,234,234,234
 540 DATA202,202,234,234,208,216,136,136,234,234,208,2
08,96,162,80,142,8,151,32
 550 DATA172,49,234,234,174,8,151,234,234,234,234,173,
1,151,157,254,149,173,2
 560 DATA151,157,255,149,202,202,234,234,208,223,96,16
9
 570 DATA13,141,80,150,169,20,141,81,150,96,234,234,23
4,234,234,141,220
 580 DATA187,141,221,187,96,234,234,234,234,234,234,23
4,234
 590 DATA234,162,12,32,124,247,162,20,142,128,187,96,1
69,7,141,225,2,32,16,242
 600 DATA96,32,194,50,32,230,50,96,32,120,235,201,10,2
40,13,201,11,240,13,201
 610 DATA7,240,13,201,8,240,13,96,238,80,150,96,206,80
,150,96,238,81,150,96
 620 DATA206,81,150,96,173,80,150,141,1,151,173,81,150
,141,2,151,32,161,49,32
 630 DATA225,49,173,152,49,141,82,150,173,153,49,141,8
3,150,234,234,234,234,96
 640 DATA173,82,150,141,24,51,173,83,150,141,25,51,169
,42,141,171,188,96,173,82
 650 DATA150,141,42,51,173,83,150,141,43,51,169,22,141
,171,188,96,169,20,162,0
 660 DATA157,128,187,232,224,160,208,248,162,0,157,104
,191,232,224,240,208,248
 670 DATA141,64,191,141,32,188,141,72,188,141,112,100,
141,152,188,141,192,188
 680 DATA141,232,188,141,16,189,141,56,189,141,96,189,
141,136,189,141,176
 690 DATA189,141,216,189,141,0,190,141,40,190,141,80,1
90,141,120,190,141,160
 700 DATA190,141,200,190,141,240,190,141,24,191,96,173
,82,150,141,84,150,173,83
 710 DATA150,141,85,150,96,169,195,141,80,150,169,189,
141,81,150,96,173,82,150
 720 DATA141,168,51,173,83,150,141,169,51,173,171,188,
201,150,208,3,32,178,51,96
 730 DATA32,181,250,173,84,150,141,24,51,141,82,150,17
3,85,150,141,25,51,141,83
 740 DATA150,32,234,51,76,21,51,169,48,162,14,157,0,15
2,202,208,250,169,2,141,9
 750 DATA151,96,234,234,234,234,234,234,234,234,234,23
4,234,234,234,173,221,187
 760 DATA233,48,208,50,169,53,141,221,187,173,220,187,
233,48,208,44,169,57,141
 770 DATA220,187,173,219,187,233,48,208,36,169,57,141,
219,187,173
 780 DATA218,187,233,48,208,28,169,40,141,210,107,141,
219,187,32,151,50,76,205
 790 DATA51,169,48,141,221,187,96,206,220,187,96,206,2
19,187,96,206,218,187,96
 800 DATA173,82,150,141,66,52,173,83,150,141,67
 810 DATA52,173,171,188,201,147,208,3,32,76,52,96,234,
234,234,173,84,150,141,82
 820 DATA150,173,85,150,141,83,150,238,9,151,238,9,151
,32,140,52,76,175,54,162
 830 DATA0,160,251,32,144,245,169,0,170,138,72,169,0,3
2,134,250,162,0,202,208
 840 DATA253,104,170,232,224,0,208,237,169,5,162,252,3
2,144,245,96,173,220,187
 850 DATA105,2,201,58,16,4,141,220,187,96,233,10,141,2
20,187,238,219,187,173,219
 860 DATA187,201,58,16,1,96,169,48,234,234,141,219,187
,238,218,187,173,218,187
 870 DATA201,58,16,1,96,169,58,141,218,187,96,173,152,
49,141,211,52,173,153,49
 880 DATA141,212,52,76,69,54,169,43,141,83,189,76,12,5
3,162,7,189,0,152,157,217
 890 DATA187,202,208,247,162,7,189,7,152,157,235,187,2
02,208,247,96
 900 DATA234,234,234,234,234,189,0,150,141,1,151,189,1
,150,141
 910 DATA2,151,32,161,49,32,225,49,174,11,151,76,193,5
2
 920 DATA234,234,234,234,234,234,234,174,11,151,76,46,
54,234,234,234
 930 DATA234,234,234,234,234,234,234,234,234,173
```

(continued on next page)

(continued from previous page)

```
940 DATA82,150,141,58,53,234,234,234,173,83,150,141,5
9,53,234,234,234,169,42
950 DATA141,0,0,96,169,14,141,145,191,141,185,191,141
,129,187,141,169,187,169
960 DATA70,141,166,191,141,206,191,141,141,187,141,18
1
970 DATA187,169,82,141,167,191,141,207,191,141,142,18
7,141,182,187,169,65,141
980 DATA168,191,141,208,191,141,143,187,141,183,187,1
69,71,141,169,191,141,209
990 DATA191,141,144,187,141,184,187,169,71,141,170,19
1,141,210
1000 DATA191,141,145,187,141,185,187,169,39,141,171,1
91,169,83,141,172,191,141
1010 DATA212,191,169,67,141,147,187,141,187,187,76,18
7
1020 DATA54,234,234,96,173,9,151,24,74,74,141,184,53,
169,21,233,1,141,118,2
1030 DATA173,118,2,201,0,208,249,96,234,234,234,173,8
3,150,141,212,53,234,234
1040 DATA234,169,22,141,0,0,96,162,0,189,0,150,141,1,
151,189,1,150,141,2,151
1050 DATA142,11,151,32,161,49,32,225,49,174,11,151,17
3,152,49,141,2,54,173,153
1060 DATA49,141,3,54,76,101,54,169,22,141,83,189,185,
0,150,205,80,150,208,3
1070 DATA76,22,54,16,2,48,38,222,0,150,189,1,150,205,
81,150,208,3,76,43,54
1080 DATA16,2,48,26,222,1,150,234,234,234,76,239,52,1
74,11,151,232,232,236
1090 DATA9,151,208,160,96,254,0,150,76,22,54,254,1,15
0,76,43,54,173,211,52
1100 DATA141,82,54,173,212,52,141,83,54,173,83,189,23
4,201,150,208,9,32,225,250
1110 DATA32,140,52,76,46,54,76,208,52,173,2,54,141,14
0,54,173,3,54,141,141,54
1115 DATA234,234,234,234,234,234,234,234,234,234,234,
234,234,234,234,234,234
1120 DATA234,234,234,234,234,234,234,234,234,173,83,1
89,201,150
1130 DATA208,4,234,76,49,54,76,255,53,216,53,234,234,
234,234,173,3,151,56,233
1140 DATA192,176,5,169,192,141,3,151,96,234,234,169,1
,141,12,151,96,169,0,141
1150 DATA12,151,96,169,72,141,148,187,141,188,187,169
,65,141,149,187,141,189
1160 DATA187,169,83,141,150,187,141,190,187,169,69,14
1,151,187,141,191,187,96
1170 DATA234,234,173,9,151,56,233,20,176,15,173,9
1180 DATA151,24,106,105,48,234,141,162,191,141
1190 DATA202,191,96,173,9,151,24,106,238,161
1200 DATA191,238,201,191,56,233,10,176,245,105
1210 DATA58,141,162,191,141,202,191,96,169,47
1220 DATA141,161,191,141,201,191,76,222,54,234
1230 DATA234,234,234,234,169,48,162,7,157,0
1240 DATA152,202,208,250,169,2,141,9,151,96
1250 DATA162,7,189,235,187,157,7,152,202,208
1260 DATA247,96,234,234,234,231,162,0,189,210
1270 DATA187,56,253,236,187,144,27,189,218,187
1280 DATA221,236,187,208,6,232,224,7,208,234
1290 DATA96,162,7,189,217,187,157,235,187,202
1300 DATA208,247,234,234,96,157,235,187,202,208
1310 DATA247,96,162,7,189,217,187,157,0,152
1320 DATA202,208,247,96,234,234,234,234
```

Destroyer

Philip Orr,
Glengormley,
Co. Antrim.

AMSTRAD

THIS PROGRAM uses either joystick or keyboard. You are the commander of a destroyer and you must destroy the enemy submarines. There are four submarines on the screen travelling at different speeds and worth different points.

sub 1 = 1 point.
sub 2 = 10 points.
sub 3 = 30 points.
sub 4 = 50 points.

There is also a time limit of three minutes in which you must get as many points as you can. To make matters worse underground bombers are constantly firing missiles up towards you. If one of these missiles hits you then you lose.

```
80 SYMBOL AFTER 128
90 FOR a=128 TO 148
100 READ b,c,d,e,f,g,h,i
110 SYMBOL a,b,c,d,e,f,g,h,i
120 NEXT
130 cloud$=CHR$(140)+CHR$(141)+CHR$(142)+CHR$(143)
140 clouds$=CHR$(144)+CHR$(145)+CHR$(146)+CHR$(147)
150 DATA 0,192,99,63,42,63,96,192,0,0,192,160,240,224,
0,0,0,0,3,5,15,7,0,0,0,3,198,252,84,232,6,3,0,0,3,6,15
,255,31,7
160 DATA 0,0,48,98,244,252,252,248,0,0,2,3,7,2,0,0,0,0
,32,192,192,64,0,0,13,31,29,46,60,31,15,3,128,224,224,
48,112,224,192,128
170 DATA 144,96,96,240,240,96,96,0,0,96,96,240,240,96,
96,144,0,1,3,7,55,127,127,255,199,239,223,191,255,255,
255,255,0,248,248,247,23
9,255,255,255,0,0,0,128,192,0,128,192
180 DATA 255,255,127,31,30,0,0,0,255,255,255,255,255,2
06,0,0,255,255,255,255,247,227,0,0,224,224,224,192,192
,128,0,0,0,0,0,0,204,255
,255,255
190 MODE 1:BORDER 0:INK 0,0:INK 1,18:INK 2,6:INK 3,18,
0:SPEED INK 5,5:BORDER 0:PAPER 0
200 LOCATE 15,1:PEN 1:PRINT "DESTROYER"
210 MOVE 220,300:DRAW 370,380
220 PEN 2:LOCATE 3,3:PRINT " You are the commander of
a submarine  destroyer. It is your job to destroy the
enemy subs.":PRINT:PEN 1
230 PRINT " You control the destroyer by either  usi
ng the joystick or the left and rightcursor keys. To d
rop the depth charges  p
ress the space bar or the FIRE button  on the Joystick
.":PRINT:PEN 2
240 PRINT " The further down the screen the Sub is the
 more points you get.":PRINT:PEN 1
250 PRINT " There is a time limit of 3 minutes in  whi
ch you must get the highest amount  of points you can
.":PRINT:PEN 2
260 LOCATE 13,21:PRINT "Good Luck!!!!!":PRINT:PEN 3
270 LOCATE 13,23:PRINT "PRESS ANY KEY"
280 A$=INKEY$: IF A$="" THEN 280
290 FOR a=1 TO 26:PRINT:NEXT
300 INK 0,1:INK 1,0:INK 2,24:INK 3,11:INK 4,12:INK 5,2
6:INK 6,6:INK 7,6,24:SPEED INK 10,10:MODE 0
310 PAPER 1:LOCATE 1,1:PRINT SPACE$(20)
320 PEN 2:LOCATE 1,1:PRINT "Score:";score
330 PAPER 3:FOR a=2 TO 9:LOCATE 1,a:PRINT SPACE$(20):N
EXT
340 PAPER 1:FOR a=23 TO 25:LOCATE 1,a:PRINT SPACE$(20)
;:NEXT
350 PLOT 23,40,5:DRAW 612,40:DRAW 612,10:DRAW 23,10:DR
AW 23,40
354 PAPER 0
355 LOCATE 1,22
356 FOR a=1 TO 20:PRINT CHR$(148);:NEXT
360 PEN 5:PAPER 3
370 RESTORE 430
380 FOR a=1 TO 6
390 READ b,c
400 LOCATE b,c:PRINT CHR$(22)+CHR$(1);cloud$
410 LOCATE b,c+1:PRINT clouds$+CHR$(22)+CHR$(0)
420 NEXT
425 PAPER 1
430 DATA 3,3,7,5,10,2,6,4,15,2,13,6
440 PEN 2:LOCATE 2,24:PRINT "time:";:PAPER 6:PRINT "
 ";:PAPER 2:PRINT SPACE$(10):PAPER 1
450 xship=9:sub1=10:sub2=18:sub3=5:sub4=17:clock=300:b
=0:ybomb=9:arr=607:subomb=0:xbom=INT(RND*19)+2:ybom=21
:astic=0
460 sub1=sub1+0.5:sub2=sub2-1:sub3=sub3+1.2:sub4=sub4-
1.6:astic=astic+1
470 IF astic=5 THEN SOUND 1,50,10,5
480 IF astic=10 THEN SOUND 1,50,10,3:astic=0
490 GOSUB 930
500 LOCATE xship,9:PAPER 3:PEN 5:PRINT " ";CHR$(132);C
HR$(133);" "
510 PAPER 0:PEN 4
520 LOCATE sub1,12:PRINT " ";CHR$(128);CHR$(129)

530 LOCATE sub2,15:PRINT CHR$(130);CHR$(131);" "
540 LOCATE sub3,10:PRINT "  ";CHR$(128);CHR$(129)
550 IF subomb=1 THEN GOSUB 1050
560 LOCATE sub4,21:PRINT CHR$(130);CHR$(131);"  "
570 IF sub1>16 THEN LOCATE sub1,12:PRINT "    ":sub1=1
580 IF sub2<2 THEN LOCATE sub2,15:PRINT "    ":sub2=18

590 IF subomb=1 THEN GOSUB 1050
600 IF sub3>16 THEN LOCATE sub3,18:PRINT "    ":sub3=1
610 IF sub4<2 THEN LOCATE sub4,21:PRINT "    ":sub4=18

620 IF INT(RND*10)+1=5 AND subomb=0 THEN subomb=1
630 IF subomb=1 THEN GOSUB 1050
635 a$=INKEY$
640 IF JOY(0)=4 OR INKEY(8)=0 THEN xship=xship-1
650 IF JOY(0)=8 OR INKEY(1)=0 THEN xship=xship+1
660 IF JOY(0)=16 AND b=0 OR a$=" " AND b=0 THEN x=xshi
p+3:b=1
670 IF b=1 THEN GOSUB 710
680 IF xship=0 THEN xship=1
690 IF xship=18 THEN xship=17
```

```
700 GOTO 460
710 ybomb=ybomb+1
720 PEN 4:LOCATE x,ybomb-1:PRINT " ":LOCATE x,ybomb:PR
INT CHR$(138)
730 IF ybomb=12 AND x>=sub1+1 AND x<=sub1+2.5 THEN GOS
UB 790
740 IF ybomb=15 AND x>=sub2 AND x<=sub2+1.8 THEN GOSUB
 790
750 IF ybomb=18 AND x>=sub3+1 AND x<=sub3+2.5 THEN GOS
UB 790
760 IF ybomb=21 AND x>=sub4 AND x<=sub4+2 THEN GOSUB 7
90
770 IF ybomb=21 AND x<>sub4 AND x<>sub4+2 THEN LOCATE
x,ybomb:PRINT " ":b=0:ybomb=9
780 RETURN
790 FOR a=1 TO 5
800 PEN 7:LOCATE x,ybomb:PRINT CHR$(134);CHR$(135)
810 IF a=1 OR a=3 THEN SOUND 3,0,15,6,0,0,2
820 PEN 7:LOCATE x,ybomb:PRINT CHR$(136);CHR$(137)
830 IF a=4 THEN SOUND 2,0,10,7,0,0,4
840 NEXT
850 LOCATE x,ybomb:PRINT "  ":
860 IF ybomb=12 THEN sub1=1:LOCATE 1,12:PRINT SPACE$(2
0);:score=score+1
870 IF ybomb=15 THEN sub2=16:LOCATE 1,15:PRINT SPACE$(
20);:score=score+10
880 IF ybomb=18 THEN sub3=1:LOCATE 1,18:PRINT SPACE$(2
0);:score=score+30
890 IF ybomb=21 THEN sub4=16:LOCATE 1,21:PRINT SPACE$(
20);:score=score+50
900 b=0:ybomb=9
910 PEN 2:PAPER 1:LOCATE 7,1:PRINT score:PAPER 0:PEN 4
920 RETURN
930 PLOT acc,32,1
940 DRAW acc,14
950 acc=acc-0.9
960 IF acc<192 THEN 980
970 RETURN
980 LOCATE 7,10:PEN 7:PAPER 0:PRINT "GAME OVER":FOR A=
1 TO 1000:NEXT
990 INK 8,24,6:LOCATE 3,20:PAPER 0:PEN 8:PRINT "Do you
 want another      game (y/n)      "
1000 a$=LOWER$(INKEY$)
1010 IF a$="" THEN GOTO 1000
1020 IF a$="y" THEN 290
1030 IF a$="n" THEN INK 0,0:BORDER 0:PAPER 0:INK 1,18:
PEN 1:MODE 1:END
1040 GOTO 1000
1050 LOCATE xbom,ybom:PRINT " ':ybom=ybom-1:LOCATE xbo
m,ybom:PRINT CHR$(139)
1060 IF ybom=9 AND xbom>=xship+1 AND xbom<=xship+2 THE
N acc=191:GOSUB 1090:RETURN
1070 IF ybom=9 THEN LOCATE xbom,ybom:PAPER 3:PRINT " "
:PAPER 0:xbom=INT(RND*19)+2:ybom=21
1080 RETURN
1090 '
1100 FOR a=1 TO 10
1110 PEN 7:PAPER 3:LOCATE xship+1,9
1120 PRINT CHR$(134);CHR$(135)
1130 IF a=1 OR a=3 THEN SOUND 3,0,15,6,0,0,5
1140 LOCATE xship+1,9
1150 PRINT CHR$(136);CHR$(137)
1160 IF a=4 THEN SOUND 2,0,10,7,0,0,11
1170 NEXT
1180 LOCATE xship+1,9:PAPER 3:PRINT "  ":LOCATE xship+
1,8:PRINT "  ":PAPER 0
1185 score=0
1190 PEN 4:ybom=22:RETURN
```

Blackjack

David Potter,
Alton,
Hampshire.

BBC

HERE IS a program called Blackjack for the 32K BBC micro. This program allows the user to play the computer at a game of Pontoon. The aim of the game of course is to make your cards total 21 or as near that as possible, but without exceeding you bust.

You both start with £100 and when your first card is dealt you bet on it, and another one is dealt. You can then stick with what you have got by pressing the space bar, or twist to get another card by pressing the Return key or buy another card, thus increasing your stake, by pressing B. If you go bust then the computer takes your bet.

When you stick the computer then has its go, and depending on the value of its cards you either win or lose that hand.

Blackjack program 1.

```
 10REM Blackjack (C) David Potter
 20*TV255
 30ENVELOPE2,1,0,0,0,0,0,0,10,0,0,-2,80,0
 40ENVELOPE3,1,2,-1,0,20,60,0,126,0,0,-126,126,0
 50ENVELOPE4,3,0,0,0,1,1,1,120,-5,-5,-10,120,90
 60VDU23,224,8,28,28,107,127,107,8,28
 70VDU23,225,8,28,62,127,62,28,8,0
 80VDU23,226,54,127,127,127,62,28,8,0
 90VDU23,227,8,28,62,127,127,127,28,62
100VDU23,228,1,3,7,15,31,63,127,255
110VDU23,229,128,192,224,240,248,252,254,255
120VDU23,230,255,127,63,31,15,7,3,1
130VDU23,231,255,254,252,248,240,224,192,128
140VDU23,232,0,0,15,15,63,63,63,63
150VDU23,233,0,0,60,60,255,255,255,255
160VDU23,234,63,63,15,15,3,3,0,0
170VDU23,235,255,255,252,252,240,240,192,192
180VDU23,236,0,0,3,3,3,3,63,63
190VDU23,237,192,192,240,240,240,240,255,255
200VDU23,238,63,63,60,60,0,0,3,3
210VDU23,239,255,255,207,207,192,192,240,240
220VDU23,242,255,255,255,255,15,15,63,63
230VDU23,243,252,252,252,252,192,192,240,240
240VDU23,244,1,1,3,3,7,15,63,255
250VDU23,245,128,128,192,192,224,240,252,255
260VDU23,246,255,63,15,7,3,3,1,1
270VDU23,247,255,252,240,224,192,192,128,128
280VDU23,248,3,3,15,15,63,63,255,255
290VDU23,249,0,0,192,192,240,240,252,252
300CHAIN"BLACKJACK2"
```

Blackjack program 2.

```
   10MODE1:DIMA$(20):GCOL0,3:MOVE0,0:DRAW0,1020:DRAW12
76,1020:DRAW1276,0:DRAW0,0:GCOL0,1:MOVE10,1010:DRAW126
6,1010:DRAW1266,914:DRAW10,914:DRAW10,1010
   20PROCD("Blackjack",464,992,3):PROCD("Blackjack",46
8,988,3):PROCD("Blackjack",472,984,1):PROCD("Bet=",832
,992,2):PROCD("Bet=",836,988,0):PROCD("Bet=",840,984,2
):PROCD("'",948,988,3)
   30MO$=CHR$8+CHR$8+CHR$10:DI$=CHR$228+CHR$229+MO$+CH
R$230+CHR$231:CL$=CHR$236+CHR$237+MO$+CHR$238+CHR$239:
SP$=CHR$248+CHR$249+MO$+CHR$242+CHR$243:HE$=CHR$232+CH
R$233+MO$+CHR$234+CHR$235
   40CR1%=100:CR2%=100:CCLOUR2:PRINTTAB(1,1)"ME..";:CO
LOUR3:PRINT'`100.00":COLCUR2:PRINTTAB(1,2)"YOU.";:COLO
UR3:PRINT"`100.00"
   50ST%=0:PROCST:VDU28,1,30,38,4:CLS:VDU28,2,30,37,28
:@%=&20209
   60GCOL0,1:MOVE60,30:DRAW60,120:DRAW1220,120:DRAW122
0,30:DRAW60,30:GCOL0,3:MOVE448,916:DRAW448,1006:MOVE83
2,916:DRAW832,1006:PROCD("Your Hand:",64,892,2):AA=0:U
=A:V=0:A=0:X=2:V2=0:PROCDEAL:V=V+1:A=A+J:PROCD("My Han
d:",64,510,2)
   70PROCSQ(96,160,1)
   80VDU4:CLS:COLOUR3:PRINT'" Please Input Your stake:
";:INPUT" "ST%:IF ST%>CR1% THEN COLOUR1:CLS:SOUND3,3,
10,10:PRINT'" Stake larger than credit try again":TIME
=0:REPEATUNTILTIME>250:GOTO80
   90IF ST%<=0 THEN COLOUR1:CLS:SOUND3,3,10,10:PRINT'"
 Oh come on chicken!":TIME=0:REPEATUNTILTIME>200:GOTO8
0
  100PROCST:CR1%=CR1%-ST%:PROC5C:PROCDEAL:V=V+1:A=A+J:
PROCSQ(320,160,1):VDU4:CLS:GOTO320
  110DEFPROCDEAL
  120J=INT((RND(1)*13))+1:OJ=J
  130IF J=1 W$="A":GOTO180
  140IF J=11 W$="J":J=J-1:GOTO180
  150IF J=12 W$="Q":J=J-2:GOTO180
  160IF J=13 W$="K":J=J-3:GOTO180
  170W$=STR$(J)
  180K=INT(RND(1)*4)+1
  190IF K=1 R$="S"
  200IF K=2 R$="H"
  210IF K=3 R$="D"
  220IF K=4 R$="C"
  230L=-1:REPEAT:L=L+1:IF W$+R$=A$(L) THEN120
  240UNTIL L=U
  250U=U+1:A$(U)=W$+R$
  260IF X=1 YY%=160 ELSE YY%=544
  270PROCCARD((V*224)+96,YY%)
  280IF W$="A" THEN ON X GOTO 300,290 ELSE ENDPROC
  290VDU4:CLS:COLOUR3:INPUT " Amount For Ace",G:IF G<>
1 AND G<>11 COLOUR1:CLS:SOUND3,3,10,10:PRINT'" Either
1 Or 11!":TIME=0:REPEATUNTILTIME>200:GOTO290 ELSE J=G:
CLS:VDU5:ENDPROC
  300IF (AA+11)<=21 THEN J=11 ELSE J=1
  310ENDPROC
```

(continued on next page)

(continued from previous page)

```
320IF A>21 THEN 400
330IFV=5 THEN 370
340VDU4:CLS:COLOUR3:PRINT'" Command:":A$=GET$:VDU5
350IF A$=CHR$13 THEN 360 ELSE IF A$=" " THEN 370 ELS
E IF A$="B" PROCBUY ELSE 340
360PROCDEAL:A=A+J:V=V+1:GOTO320
370VDU4:CLS:COLOUR3:PRINT'" MY TURN":VDU5
380V2=V:V=0
390X=1:PROCDEAL:AA=AA+J:V=V+1:IF AA<17 AND V<5 THEN
390
400VDU4,28,2,30,37,28:CLS:@%=10:COLOUR2:PRINT" I Sco
red...";AA:COLOUR3:PRINT" You Scored.";A:@%=&20209
410IF AA>21 COLOUR2:PRINTTAB(15,0)"I Bust":WI=1
420IF A>21 COLOUR3:PRINTTAB(15,1)"You Bust":WI=2
430IF V2<5 AND V<5 AND AA<21 AND A<21 THEN 440 ELSE
450
440IF A>AA COLOUR3:PRINTTAB(15,1)"You Win":WI=1:GOTO
510 ELSE COLOUR2:PRINTTAB(15,0)"I Win":WI=2:GOTO510
450IF AA=21 AND V=2 COLOUR2:PRINTTAB(15,0)"Blackjack
.I Win":CR2%=CR2%+ST%:WI=2:GOTO 510
460IF A=21 AND V2=2 COLOUR3:PRINTTAB(15,1)"Blackjack
.You Win":CR1%=CR1%+ST%:WI=1:GOTO 510
470IF AA<22 AND V=5 AND AA>0 COLOUR2:PRINTTAB(15,0)"
5 Card Trick.I Win":WI=2:GOTO 510
480IF A<22 AND V2=5 COLOUR3:PRINTTAB(15,1)"5 Card Tr
ick.You Win":WI=1:GOTO 510
490IF AA=21 COLOUR2:PRINTTAB(15,0)"Pontoon.I Win":WI
=2:GOTO510
500IF A=21 COLOUR3:PRINTTAB(15,1)"Pontoon.You Win":W
I=1
510IF WI=1 THEN SOUND1,4,80,30:CR1%=CR1%+(ST%*2):CR2
%=CR2%-ST% ELSE CR2%=CR2%+ST%:FORI-40TO0STEP 4:SOUND3,
3,I,2:NEXT
520PROCSC
530IF CR1%=0 OR CR2%=0 VDU28,1,24,38,4:CLS:GOTO540 E
LSE 570
540IF CR1%=0 THEN PROCD("You Lose Turkey!",352,736,2
) ELSE PROCD("OK You Win This Time Sucker!",160,736,2)
550PROCD("For Another Round Of Blackjack,",112,608,1
):PROCD("Press The Space Bar.",288,516,1)
560REPEAT:B$=GET$:UNTILB$=" ":VDU28,0,31,39,0:GOTO40
570VDU28,1,17,38,16:CLS:PROCD("Press Space For Anoth
er Hand.",144,512,1):REPEAT:B$=GET$:UNTILB$=" ":VDU4:G
OTO50
580DEFPROCCARD(X%,Y%):PROCSQ(X%,Y%,3):ON K GOTO 590,
600,610,620
590GCOL0,0:CO%=0:MOVEX%,Y%+192:VDU227:MOVEX%+162,Y%+
64:VDU227:CE$=SP$:PROCM:ENDPROC
600GCOL0,1:CO%=1:MOVEX%,Y%+192:VDU226:MOVEX%+162,Y%+
64:VDU226:CE$=HE$:PROCM:ENDPROC
610GCOL0,1:CO%=1:MOVEX%,Y%+192:VDU225:MOVEX%+162,Y%+
64:VDU225:CE$=DI$:PROCM:ENDPROC
620GCOL0,0:CO%=0:MOVEX%,Y%+192:VDU224:MOVEX%+162,Y%+
64:VDU224:CE$=CL$:PROCM:ENDPROC
630DEFPROCM:MOVEX%+130,Y%-96:J$=STR$(OJ):IF LEN(J$)=
1 OR OJ>10 VDU9
640IF OJ>1 AND OJ<11 THEN PRINT;J$ ELSE PRINT;W$
650MOVEX%,Y%+224:IF OJ>1 AND OJ<11 THEN PRINT;C$ ELS
E PRINT;W$
660IF OJ>1 AND OJ<11 THEN PROCD(J$,X%+32,Y%+160,CO%)
 ELSE IF OJ<>1 PROCD(W$,X%+32,Y%+160,CO%)
670IF OJ=1 MOVEX%+64,Y%+160:PRINTCE$
680ENDPROC
690DEFPROCSQ(X%,Y%,COL):GCOL0,COL:MOVEX%,Y%:MOVEX%+1
92,Y%:PLOT85,X%+192,Y%+256:MOVEX%,Y%+256:PLOT85,X%,Y%:
VDU5:GCOL0,0:MOVEX%,Y%+32:VDU245:MOVEX%+164,Y%+30:VDU2
44:MOVEX%+164,Y%+256:VDU246:MOVEX%,Y%+256:VDU247:SOUND
0,2,4,1:SOUND0,0,0,0:ENDPROC
700DEFPROCST:VDU28,32,2,38,1:CLS:IF ST%=0 PROCD("0.0
0",1024,988,3):GOTO720
710ST$=STR$(ST%):PROCD(ST$,1008,988,3):AL=LEN(ST$)*3
2:PROCD(".00",AL+1024,988,3)
720VDU23,2,30,37,28:ENDPROC
730DEFPROCSC:VDU26,0,31,39,0:COLOUR3:IF CR2%<=0 CR2%
=0:COLOUR1
740PRINTTAB(6,1);CR2%;"  ":COLOUR3:IF CR1%<=0 CR1%=0
:COLOUR1
750PRINTTAB(6,2);CR1%;"  ":COLOUR3:VDU28,2,30,37,28:
ENDPROC
760DEFPROCBUY
770VDU4:COLOUR2:CLS:PRINT'" How much do you want to
pay ?";:INPUT" "BU%:IF BU%>CR1% THEN COLOUR1:CLS:SOUN
D3,3,10,10:PRINT'" Too much try again!":TIME=0:REPEATU
NTILTIME>200:CLS:GOTO770
780ST%=ST%+BU%:CR1%=CR1%-BU%:PROCST:PROCSC:CLS:ENDPR
OC
790DEFPROCD(A$,K,L,CO)
800GCOL0,CO:LOCAL N:A%=&A:X%=0:Y%=&A:D=&A00:IF LEN(A
$)=1 K=K+16
810FORN=1 TO LEN(A$):B$=MID$(A$,N,1):?D=ASC(B$):CALL
(&FFF1):VDU23,240,D?1,D?1,D?2,D?2,D?3,D?3,D?4,D?4,23,
241,D?5,D?5,D?6,D?6,D?7,D?7,D?8,D?8:VDU5:MOVEK+(N*32),
L:VDU240:MOVEK+(N*32),L-32:VDU241:NEXT N:VDU4:ENDPROC
```

Utilities

T S Wharton,
County Durham.

VIC-20

THIS IS A LOADER program for three machine-code routines which are as follows:

■ A cassette moter switch: this switches the cassette motor on so that tapes can be re-wound or fast forwarded while you are using the keyboard to program or a program is running.

The relevant Data statements are in lines 40-50. After running type:

SYS 673

F1 Key will now switch the cassette motor on
F3 Key will switch it off.

To kill this routine press Run Stop/Restore.

■ Random character colour: this brightens the screen up when you are typing by changing the colour of each character as you type. The cursor also flashes different colours. It does not print a character the same colour as the screen so all characters should be visible whichever screen colour you use. It also adds colour to the listings.

The relevant Data statements are in lines 70-80. After running type:

SYS 673

To kill this routines pres Run Stop/Restore.

■ Clear screen: this routine enables you to clear areas of the screen and leave the rest intact

SYS 673 clears the top half of the screen. As it is it clears the top eleven lines. To change the number of lines Poke 674, X where X is a number between 0-22. This clears X+1 lines.

SYS 678 clears the bottom half of the screen. The routine will clear the bottom twelve lines. To change this Poke 685 to a number between 0-21. This routine can also be used to clear the middle to the screen by poking a number between 0-22 to location 679 which is greater than that in location 685.

SYS 691 clears the left eleven columns of the screen. To change the number of columns Poke 694 with a number between 0-21.

SYS 704 clears the right eleven columns. To change Poke 724 with a number between 0-20.

To use the routines type in the loader and the relevant data statements for the routine you want. The first two will not run together. The third can be used with the other two if it is loaded into a different area of memory as long as the call addresses to the routines are changed to the new memory area.

Vic utilities

```
10 G=673
20 READA:IFA=999THENEND
30 POKEG,A:G=G+1:GOTO20
39 REM***CASSETTE MOTOR SWITCH
40 DATA120,169,174,141,20,3,169,2,141,21,3,88,96,165,157,201,39,240,7,201,47,240
,22,76
41 DATA191,234,173,17,145,9,64,141,17,145,173,28,145,41,12,141,28,145,76,191,234
,169,254
42 DATA141,28,145,169,62,141,17,145,76,191,234
50 DATA999

69 REM***RANDOM CHARACTER COLOUR
70 DATA120,169,174,141,20,3,169,2,141,21,3,88,96,169,0,141,27,145,173,24,145,77,
20,145
71 DATA14,7,133,254,173,13,144,74,74,74,74,41,7,197,254,208,14,56,42,41,7,201,7,
208,3
72 DATA10,41,7,24,133,254,165,254,141,134,2,76,191,234
80 DATA999

85 REM***CLEAR SCREEN
86 :
87 :
89 REM***TOP
90 DATA162,10,76,123,229
99 REM***BOTTOM
100 DATA162,22,32,141,234,202,224,10,208,248,76,129,229
109 REM***LEFT
110 DATA162,22,160,13,32,143,234,202,16,248,76,129,229
119 REM***RIGHT
120 DATA162,22,160,21,32,126,234,32,178,234,169,32,145,209,169,1,145,243,136,152
121 DATA10,208,237,232,16,232,76,129,229
125 DATA999
```

Tape Index

Terence Brown,
Ponteland,
Newcastle upon Tyne.

SPECTRUM

THIS PROGRAM creates a file of the cassettes contents and should normally be saved at the beginning of side 1. It may be used for either the 16K or 48K Spectrum. After entering the program, Run. You will then be asked to enter the Tape Title after which the menu is given providing options to:

1. Print Contents of cata memory.
2. LPrint Contents of data memory.
3. Enter new data into memory.
4. Change existing data memory.
5. Save program and data memory.
6. Stop program.

After the program has been saved any future Load will result in it auto starting at option 1.

When entering Data there is no need to enter the data in order as the program contains a Sort subroutine — lines 900 to 930 — which will sort into order of, first, side and then tape counter.

For those who do not yet know how to enter line 0, enter this line as line 1 and after that Enter as a direct command

POKE 23756,0

Line 1 will now be changed to line 0.

The data memory has been dimensioned as 18 because this fills one screen without being asked "scroll?" and this is usually sufficient for most computer tapes. However, if additional data memory is required then alter the value of "y" in line 10.

If you Break the program for any reason do not type Run as this will clear all variables/strings. Restart by entering

GOTO 40

However, once the program has been used it may be reused on another tape by breaking the program — option 6 — then press Run to clear the memory for new data.

```
  0>REM ** TAPE INDEX
     ©    TERRY BROWN
  10 LET y=18: DIM w(y): DIM c$(
y,4): DIM p$(y,10): DIM d$(1): D
IM e$(3): FOR n=1 TO y: LET w(n)
=n: NEXT n
  20 INPUT AT 0,0;"TAPE TITLE  "
; LINE t$
  25 IF LEN t$>32 THEN GO TO 20
  30 LET c$(1)="1000": LET p$(1)
="DTS  INDEX"
  40 BORDER 7: PAPER 7: INK 0: B
RIGHT 0: CLS
  50 PRINT AT 0,8;"
  ";AT 1,8;" CONTENTS INDEX ";A
T 2,8;"  "
  60 PRINT ''"OPTIONS AVAILABLE"
''''"  1 >>  PRINT CONTENTS"''''
 2 >>  LPRINT CONTENTS''''"  3 >>
 ENTER NEW DATA"''''"  4 >>  CHAN
GE DATA"''''"  5 >>  SAVE"''''"  6 >
>  STOP"
  70 INPUT AT 0,0,"ENTER OPTION
NUMBER  ";LINE z$: IF z$<"1" O
R z$>"6" THEN GO TO 70
  80 GO TO VAL z$*100
 100 BORDER 7: PAPER 7: INK 0: B
RIGHT 1: CLS
 110 PRINT PAPER 2; INK 7;AT 0,I
NT ((32-LEN t$)/2);t$: GO SUB 70
0: INPUT AT 0,0;"PRESS ENTER  ";
LINE a$: GO TO 40
 200 LPRINT INVERSE 1;AT 0,INT (
(32-LEN t$)/2);t$: LPRINT
 210 LPRINT AT 2,0;"SIDE",AT 2,6
;"COUNT";AT 2,19;"PROGRAM TITLE"
 220 LPRINT : FOR n=1 TO y
 230 IF c$(w(n))<>"  " THEN LP
RINT TAB 2;c$(w(n),1);TAB 7;c$(w
(n),2 TO );TAB 20;p$(w(n))
 240 NEXT n: GO TO 40
 300 CLS : PRINT AT 1,7;"ENTERIN
G NEW DATA": FOR n=1 TO y
 310 IF c$(w(n))="  " THEN GO
SUB 800: GO SUB 820: INPUT AT 0,
0;"DO YOU WISH TO ENTER ANOTHER
?  ";LINE z$: IF a$(1)="n" OR a
$(1)="N" THEN GO TO 900
 320 NEXT n: PRINT AT 6,16;"MEMO
RY FULL": PAUSE 200: GO TO 900
 400 CLS : PRINT AT 0,9;"CHANGIN
G DATA": GO SUB 700
 410 INPUT AT 0,0;"ENTER 'SIDE'
and 'COUNT' OF ITEMTO BE CHANGED
";LINE d$;"  ";LINE e$
 420 FOR n=1 TO y
 430 IF c$(w(n))=d$+e$ THEN CLS
: PRINT AT 0,9;"CHANGING DATA":
GO SUB 800: PRINT AT 4,17;c$(w(n
),1);AT 6,17;c$(w(n),2 TO );AT 8
,17;p$(w(n)): GO SUB 820: INPUT
AT 0,0;"DO YOU WISH TO CHANGE AN
OTHER ?";LINE a$: IF a$(1)="n"
OR a$(1)="N" THEN GO TO 900
 440 NEXT n: GO TO 400
 500 CLS : PRINT AT 10,5;"REWIND
TAPE TO RECORD": SAVE "DTS" LINE
EX" LINE 100: CLS : PRINT AT 6,0
;"THIS PROGRAM HAS BEEN SAVED",A
T 10,12;"TO VERIFY";AT 14,6;"REW
IND TAPE AND PLAY": VERIFY "DTS
INDEX": GO TO 40
 600 STOP
 700 PRINT AT 2,0;"SIDE";AT 2,6;
"COUNT";AT 2,19;"PROGRAM TITLE"
 710 PRINT : FOR n=1 TO y
 720 IF c$(w(n))<>"  " THEN PR
INT TAB 2;c$(w(n),1);TAB 7;c$(w(
n),2 TO );TAB 20;p$(w(n))
 730 NEXT n: RETURN
 800 PRINT AT 4,9;"SIDE :  ";AT
6,8;"COUNT :  ";AT 8,8;"PROGRAM
 : ": RETURN
 820 INPUT AT 0,0;"ENTER  SIDE
 : ";LINE d$: PRINT AT 4,17;d$
 830 INPUT AT 0,0;"ENTER  COUNT
 : ";LINE e$: PRINT AT 6,17;e$
 840 INPUT AT 0,0;"ENTER  PROGRA
M : ";LINE p$(w(n)): PRINT AT 8
,17;p$(w(n)): LET c$(w(n))=d$+e$
 850 INPUT AT 0,0;"ARE DETAILS C
ORRECT ?";LINE z$: IF a$(1)="n
" OR a$(1)="N" THEN GO TO 820
 860 PRINT AT 4,17;"  ";AT 6,17;"
  ";AT 8,17;"  ": RETUR
N
 900 FOR k=1 TO y-1: LET l=0: FO
R j=k+1 TO y
 910 IF c$(w(j))<c$(w(k)) THEN L
ET x=w(j): LET w(j)=w(k): LET w(
k)=x: LET l=1
 920 NEXT j: IF l=0 THEN GO TO 1
00
 930 NEXT k: GO TO 100
```

Print to LPrint

Haldor Rossebo,
Norway.

ORIC

THIS MACHINE-CODE program replaces all Prints in a Basic program with LPrints, and vice versa. It was written on an Oric-1 48K, but it will also work on the 16K Atmos. The machine-code is fully relocatable.

To get the machine-code going call 38800. If you then list your Basic program you'll see that all the prints have been changed to LPrint. Another call will change them back.

The switch is located in (#)0, and other values then #BA here will make the program convert Prints to LPrints.

```
0 REM ***  PRINT <--> LPRINT  ***
1 REM ***    HALLDOR ROSSEBO   ***
2 REM ***         3/8/84       ***
3 REM
10 FORN=38800TO38888
20 READ DTA$
30 DTA=VAL("#"+DTA$)
40 ER=ER+DTA
50 POKEN.DTA
60 NEXT
70 IFER<>10322THENPRINT"DATA ERROR":STOP
80 PRINT"DATA OK. "
90 PRINT:PRINT"PRESS A KEY TO CSAVE"
95 GETA$:CSAVE"P-LP",A38800.E38888
100 DATAA0.FF.A9.00.85.01.A9.04.85
110 DATA02.A5.00.C9.BA.D0.07.AA.A9
120 DATA0F.05.00.D0.06.A9.BA.85.00
130 DATAA2.8F.A9.00.85.03.C8.D0.02
140 DATAE6.02.B1.01.C9.00.D0.09.E6
150 DATA03.A9.03.C5.03.D0.ED.60.85
160 DATA04.A5.03.C9.00.F0.11.C8.D0
170 DATA02.E6.02.E6.03.A5.03.C9.05
180 DATA90.F3.B1.01.B0.02.A5.04.C5
190 DATA00.D0.C9.8A.91.01.D0.C4
```

Catalogue

A D Oliver,
Dobwalls,
Cornwall.

DRAGON

THIS PROGRAM allows you to make a catalogue of programs stored on cassette. The program, written in position-independent code, was originally designed for Rom, but will reside anywhere in Ram.

On execution you are asked if you require a printout. Typing any other key than Y will just put a printout to the screen. To hold the present information on the screen, just turn off the tape deck.

To exit from the program you must press the reset button. ■

```
10 REM HEXLOADER - ENTER THE
20 REM STRING OF HEX DIGITS FIRST
30 REM AND THEN THE CHECKSUM
40 PRINT "ENTER START ADDRESS ";:INPUT START
50 PRINT "ENTER FINISH ADDRESS";:INPUT FINISH
60 FOR N = START TO FINISH STEP 8
65 PRINT N;":";
70 TT=0:INPUT A$:Z=0
80 FOR S=1 TO LEN(A$) STEP 2
90 P=VAL("&H"+MID$(A$,S,2))
100 TT=TT+P:POKE N+Z,P
110 Z=Z+1:NEXT
120 PRINT " - ";
130 INPUT T$
150 IF VAL(T$)<>TT THEN PRINT "ERROR - ENTER LINE AGAI
N":GOTO 73
160 NEXT

24576 : 17 01 22 30 8C 09 A6 80  =  549
24584 : 27 18 BD 80 0C 20 F7 0D  =  684
24592 : 0D 55 53 45 20 50 52 49  =  517
24600 : 4E 54 45 52 20 59 2F 6E  =  591
24608 : 20 00 BD 80 05 BC 80 06  =  631
24616 : 27 F8 81 59 27 0E 8E 01  =  698
24624 : 60 BF 02 05 17 00 EE 20  =  537
24632 : 09 8E 80 0F BF 02 05 17  =  515
24640 : 00 E3 30 8C 04 8D 35 20  =  645
24648 : 3C 0D 0D 46 49 4C 45 4E  =  452
24656 : 41 4D 45 20 20 20 20 42  =  485
24664 : 4C 4B 53 20 20 20 45 52  =  431
24672 : 52 53 0D 3D 3D 3D 3D 3D  =  433
24680 : 3D 3D 3D 3D 3D 3D 3D 3D  =  488
24688 : 3D 3D 3D 3D 3D 3D 3D 3D  =  488
24696 : 3D 3D 0D 00 A6 80 27 04  =  472
24704 : 8D 19 20 F8 39 8D 1C B6  =  854
24712 : 00 7C 26 46 8E 06 00 5F  =  475
24720 : A6 85 8D 07 5C C1 03 25  =  777
24728 : F7 20 EA BD 80 0C A0 9F  =  1174
24736 : 02 05 39 7F 02 02 7F 02  =  324
24744 : 03 8E 06 00 BF 00 7E AD  =  641
24752 : 9F A0 04 AD 9F A0 06 26  =  859
24760 : 10 B6 00 7C 27 C6 2B C4  =  798
24768 : B6 02 02 4C E7 02 02 20  =  481
24776 : EA B6 02 03 4C B7 02 03  =  685
24784 : 20 E1 8D 46 E6 08 B7 02  =  795
24792 : 01 4F F6 02 02 8D 2C 89  =  654
24800 : 30 CB 30 1E E9 8D B4 1E  =  817
24808 : 89 8D B0 8D 2D 86 08 B7  =  965
24816 : 02 01 4F F6 02 03 8D 13  =  493
24824 : 8B 30 CB 30 1E 89 8D 98  =  901
24832 : 1E 89 8D 97 86 0D 8D 93  =  394
24840 : 16 FF 7A 5B 49 81 0A 25  =  736
24848 : 03 80 0A 5C 7A 02 01 26  =  396
24856 : F2 39 86 20 C6 05 17 FF  =  946
24864 : 7A 5A 26 FA 39 BE 04 00  =  703
24872 : BF 00 0B 86 60 A7 80 8C  =  992
24880 : 06 00 26 F9 39  =  350
```

INDEX

Simon Rollins completes the updated version of the YC index. The first digit after the reference refers to the volume number, the second to issue number and the third to the page.

VIC 20
Big screen, 2, 10, 61
Cassette, 1, 5, 53
Cesil, 4, 3, 101
Colour and sound, 2, 1, 38
Communications port, 2, 3, 44
Draw, 4, 7, 105
Expansion, 3, 12, 197
Games see GAMES
High Resolution Graphics, 2, 4, 57
High Resolution Graphics, 2, 3, 29
Joystick control, 1, 4, 39
Multi-coloured graphics, 3, 1, 85
Multi-screen, 3, 7, 114
Music, 2, 2, 51
Polyphonic boogie, 3, 3, 81
Programs
3D Effect, 4, 7, 151
Alien Arcade, 2, 4, 77
Alien Flashers, 3, 10, 186
Apple Drop, 4, 10, 175
Astro Gladiator, 3, 6, 167
Block Graphics, 2, 5, 76
Bomber, 2, 12, 99
Breaking Out, 2, 4, 71
CESIL, 4, 3, 101
Changing Goals, 3, 2, 123
Change of Memory, 2, 9, 90
Character Editor, 3, 7, 175
Clock, 3, 7, 179
Decimal Liner, 3, 2, 137
Dodgems, 2, 11, 101
Dodgems, 2, 12, 212
Double Height, 3, 10, 205
Earth Invader, 2, 8, 79
Fighter Raid, 2, 5, 83
Fly-Catcher, 4, 2, 191
Footballer, 4, 3, 179
Four Routines, 3, 2, 120
Gold Grabber, 3, 8, 159
Graph Screen, 2, 11, 105
Graveyard-20, 4, 12, 189
Guess — Who — Man, 4, 9, 157
Guessing Game, 2, 3, 70
High Resolution, 2, 5, 75
Indexer, 2, 10, 85
Key To Functions, 2, 6, 73
Key Word Definer, 3, 8, 170
Life, 3, 6, 181
Life Expectancy, 2, 9, 90
Light Cycles, 4, 6, 180
Moonland, 4, 5, 171
Night Train, 3, 11, 205
On the Grid, 3, 4, 138
Peeks and Pokes, 2, 6, 67
Piano Keys, 2, 3, 73
Pinball, 4, 2, 180
Poly — Pen music, 2, 10, 93
Quick copy, 3, 1, 115
Racetrack, 2, 7, 157
Ragtime RAM, 2, 7, 83
Self Writing, 3, 10, 203
Sound Option, 3, 4, 137
Sounds Familiar, 3, 1, 139
Sounds of Alarm, 2, 8, 85
Sprinter, 5, 1, 155
Sub Hunt, 3, 5, 165
Swoosh, 4, 11, 184
Tank Killer, 3, 3, 123
The Sinus Grid (+3K expansion), 4, 5, 175
Three-D-Maze (also PET), 3, 2, 125
Treasures of Zagorsk 4, 3, 77
Treasures of Zagorsk 4, 4, 164
Tron II, 3, 9, 159
Tunnel Vision, 2, 6, 77
VIC Stick (requires a joystick), 2, 12, 106
VIC Synth, 2, 12, 103
Resolution, 3, 9, 1 3
Software survey, 2, 6, 24
Software survey, 2, 12, 30
Software survey, 3, 6, 62
Software survey, 4, 11, 57
Things to do with Your VIC, 4, 6, 139
Tricks, 3, 12, 148
Utilities
Assembler (corrections, 2, 11, 15), 2, 9, 58
Auto Number, 4, 4, 187
Backup, 4, 5, 177
Catalogue, 4, 3, 185
Disassembler, 3, 6, 80
Draw, 4, 7, 109
Expansion, 3, 10, 157
Extended Basic, 3, 11, 171
Line Delete, 4, 1, 201
MC Mover, 5, 1, 173
New Commands, 4, 12, 197
Parallel Printer Interface, 4, 2, 161
String Dump, 3, 12, 231
Utility Programs, 4, 10, 181
Zip Load, 5, 1, 151
Variables, 3, 4, 95
Vector, 2, 11, 67
Voices on the VIC, 3, 5, 167
Tomorrow's Technology, 3, 1, 34
Watson's Words, 4, 7, 69
Who's In Control, 4, 13, 71
Your Computer Index (Volumes 1-3), 4, 1, 209
Writing a Word Processor, 3, 7, 75
ZX80 – 81 Books, 1, 4, 49
ZX80 Keyboard Changes, 2, 1, 61
ZX80 – 81 Machine Code Programming, 1, 2, 26
ZX80 – 81 Machine Code Programming, 1, 4, 57
ZX80 Peeks & Pokes, 2, 1, 29
ZX80 – 81 Software Survey, 1, 3, 16
ZX80 ROM Switch, 1, 3, 39
ZX81
Adventure Writing (see corrections 2, 6, 13), 2, 4, 24
Animated Graphics (see corrections 2, 3, 11), 2, 2, 52
Betta Basic (16K — see corrections 4, 6, 43), 4, 4, 125
Capabilities, 2, 5, 37
Cards of Fate, 3, 6, 147
Chess (1K), 2, 12, 68
Chess (1K), 3, 1, 81
Chess (1K), 3, 2, 100
Draw Routine (see corrections, 4, 3, 44), 4, 2, 107
Easing Operation, 1, 4, 76
Faked EOS, 3, 10, 110
Fast Basic, 3, 7, 139
Forth Simulation, 2, 12, 84
Games see GAMES
Games writing, (1K), 2, 1, 64 (see corrections 3, 1, 27)
Games writing (1K), 2, 12, 73
Graphics, 2, 1, 48
Indexer, 2, 9, 68
Joysticks (construction), 2, 5, 46
Machine code one, 4, 57 (see corrections 1, 5, 11)
Machine code one, 2, 8, 94
Machine code two, 2, 9, 72
Machine code three, 2, 10, 68 (see corrections 3, 1, 27)
Machine code four, 2, 11, 83
Machine code editor (16K), 3, 3, 75
Machine code monitor, 2, 6, 50
Music, 2, 3, 34
Pinball, 2, 10, 46
Programs
3D OXO, 4, 6, 174
Alien Attack, 2, 7, 51
Alien Search (1K), 2, 1, 62
Ark Royal (1K), 1, 5, 79
Artful dodge (1K), 2, 6, 76
Assault craft (16K), 2, 6, 69
As you like it (1K), 2, 7, 82
Automatic Rem (16K), 2, 9, 95
Auto Ren (1K), 3, 11, 227
Bar-graph plotter (1K), 1, 1, 48
Basic truth (1K), 2, 3, 73
Bigger screen (1K), 1, 4, 72
Biorhythms (16K), 2, 4, 80
Border-line case (1K), 2, 7, 91
Board game (16K), 2, 8, 84
Bomb disposal (1K), 1, 5, 79
Bombsquad, 4, 5, 165
Bone Idle (16K), 3, 4, 151
Boogled, 4, 9, 155
Brahma (1K), 2, 4, 77
Calculated Risk (1K), 2, 2, 74
Calculator (16K), 2, 8, 84
Canyon Assault, 4, 10, 175
Card Tricks (16K), 2, 3, 69
Castle of Carmain, 4, 11, 183
Clue to Clues (1K), 2, 7, 91
Code machine, (1K), 3, 1, 119
Code storage, 2, 10, 91
Code transfer, (1K), 2, 6, 67
Column Scroll, 2, 10, 93
Complete music (16K), 1, 2, 61
Cost price, (1K), 2, 1, 70
Consult the Oracle, (1K), 1, 3, 71
Course and Time, (1K), 2, 7, 85
Cricket score, (16K), 2, 1, 64
Crossword challenge, 1, 1, 47
Cypher Breaker (1K), 2, 6, 75
Danger Man (1K), 3, 7, 153
Datacalc (Spreadsheet), 4, 2, 130
Death Worm (1K), 3, 9, 159
Dare Devil, (16K), 2, 2, 69
Dice Thrower, 2, 5, 85
Disassembling, 2, 5, 85
Double Height (+ printer), 2, 4, 61
Drawing Program (1K), 3, 6, 165
Dungeons, (1K), 2, 8, 75 (see corrections 2, 10, 15)
Effortless index (1K), 2, 1, 61
Enterprise Rescue (1K), 2, 3, 71
Equations solved (1K), 2, 2, 74
Exam marks (1K), 1, 3, 65
External inputs (Project), 2, 1, 71
Faster graphics, 2, 8, 83
Faster Slow mode, 2, 4, 79
Fighter Pilot (16K), 2, 5, 72
Figure handling (1K), 1, 4, 74
Filing Point (3.25K), 2, 9, 95
Formula for Success, 2, 2, 75
Four x four x four, (15K), 3, 8, 167
Free memory, 1, 4, 67
Golf (16K), 3, 12, 21
Graphic Strings (16K), 2, 8, 81
Green eyed monster, 1, 3, 65
Half-Life, 1, 5, 77
Hex convert, 2, 6, 76
High resolution graph, 2, 10, 87
Hot pursuit, 2, 5, 79
Innocent indexing, 1, 3, 64
Intelligent Anima (1K), 3, 9, 151
Keyboard reverse, 2, 3, 72
Kong Jump (16K), 3, 6, 170
Landscape (16K), 2, 9, 89
Lateral scroll, (16K), 2, 3, 71
Latest score (16K), 1, 3, 67
Learning fun, 2, 2, 71
Line drawer, 1, 4, 68
List remedy, 3, 3, 135
List self starters, 2, 12, 106
Lower case (16K), 2, 9, 94
Lunar manoeuvre (16K), 2, 4, 75
Machine code tips, 1, 5, 71
Maths teaching, 1, 5, 75
Matrix Mover (1K), 3, 6, 187
Maze chase, 3, 2, 128 (see corrections 3, 3, 28)
Memory economy, 2, 1, 63
Memory Man, 3, 5, 176 (1K)
Micro maestro, 2, 8, 85
Molecules (16K), 2, 3, 67
Moon lander, 2, 1, 63
Moving graphics, 1, 4, 69
Music notation, 2, 12, 109
Mystery, 2, 1, 111
Mystery program, 2, 4, 72
Never a crossword, 1, 5, 77
New quirk, 2, 12, 105
Not St Georges Day (16K), 2, 5, 76
Noughts and crosses, 2, 2, 67
Number square (15K), 3, 1, 127
Organic runes (16K), 2, 6, 70
Palindromes, 2, 5, 77
Padcalc (16K), 3, 9, 173
Pascal's Triangle, 2, 6, 69
Plotter — Planner, 2, 7, 81
Point to Point, 1, 2, 61
Polynomial Solver, 1, 1, 48
Pools Prediction, 1, 2, 65
Prime Numbers, 2, 4, 79
Program Name, 2, 11, 110
Quick Peek, 2, 12, 109
Reaction Timer, 1, 1, 47
Remember to Renumber, 1, 4, 67 (see corrections 2, 1, 11)
Rem memory, 2, 5, 97
Revolutionary Art, 1, 4, 74
Rotating Display (16K), 3, 10, 179
Rhym Band, 3, 2, 129
ROM Tricks, 2, 4, 72
Satellite Plot, 2, 4, 81
Silent Running, 2, 3, 65
Screen Artist, 1, 5, 79
Screen Flash (+ 4K), 2, 10, 95
Scroll Clear, 2, 11, 111
Scroll Roles (16K), 2, 7, 90
Search & Destroy (1K), 3, 4, 133
Search and Replace, 2, 8, 85
Security Numbers, 1, 5, 71
Sketch Pad, 1, 2, 65
Snake, 3, 2, 119 (see corrections 3, 3, 28)
Snake, 4, 1, 179
Small Enterprise, 2, 10, 83
Sound Analysis (1K), 3, 5, 165
Sounds of Alarm, 2, 8, 85 (see corrections 2, 10, 15)
Space Mining, 4, 2, 175
Speed Ball, 2, 8, 83 (corrections 2, 10, 15)
Speed Scroll, 3, 1, 119
Spiral Clear, 2, 11, 111
Standard Deviations, 2, 10, 85
Storage Technique, 2, 1, 69
Submarine, 2, 11, 99
Surround, 2, 7, 89
Surrounded (16K), 3, 5, 161
Swap, 3, 7, 161 (corrections 3, 9, 39)
Tank Attack (16K), 3, 8, 158
Teaching Aid (16K), 1, 2, 63
Telescope Modelling, 2, 2, 74
Text Compression, 4, 3, 135
The Dictator (16K), 2, 2, 67
The Plough, 1, 3, 67
The Real World, (16K), 2, 12, 99
The Wall (16K), 3, 3, 137
Three Games, 2, 12, 97
Tight Security, 3, 1, 118
Trade, 4, 4, 175
Transposing Music, 1, 5, 78
Tunnel (1K), 3, 11, 207
Turbo (16K), 3, 3, 121
The 24 line Screen, 2, 2, 73
Under Cut, 2, 10, 95
White — Dot Destroyer, 1, 1, 48
Wild Dogs, 2, 1, 70
Windmills, (16K), 2, 9, 97
Winning Sequence, 2, 5, 8
Word Puzzle (16K), 2, 10, 94 (see corrections 2, 12, 19)
Worry Maze, (16K), 3, 1, 107
Writing Aids (1K), 3, 6, 183
Writing Wrongs, 2, 1, 67
Zombies, 4, 2, 193
READ, 4, 1, 133
Software Survey, 2, 2, 24
Software survey, 3, 4, 40
Software survey 2, 11, 36
ZX Software survey, 2, 5, 20
Sorting, 2, 4, 37
Speech (corrections 4, 6, 43), 4, 5, 125
Sprite Maker (see corrections 4, 11, 40), 4, 9, 116
The ZX81 and Prestel, 4, 6, 94
Toolkit, 2, 11, 76
ZXTRA wide Text (+ printer), 3, 1, 88
ZX Memory Packs, 2, 3, 16
ZX Strings, 1, 5, 41
ZX81 Utilities
Assembler, 4, 11, 141
Backup, 4, 7, 152
Bubble Sort, 3, 12, 183
Cassette Files, 3, 8, 105 (New ROM owners see corrections 3, 10, 46)
Cassette Labels, 4, 1, 201
Character Definer, 4, 4, 19
Compiler 1, 3, 7, 139
Compiler 2, 3, 8, 77
Compiler 3, 3, 9, 119
Copy Function, 4, 1, 188
Datacalc (Spreadsheet), 4, 2, 130
Disassembler, 2, 7, 56
Draw, 3, 12, 145
Draw Routine (see corrections 4, 3, 44), 4, 2, 107
Ecological Modelling, 2, 8, 46
Education, 2, 1, 35
Head Up Display, 4, 7, 123
High Res, 4, 12, 113 (corrections 5, 1, 41)
Indexer, 2, 9, 68
Machine Code Editor, 2, 3, 75
Magic Squares, 2, 5, 40
Merge, 3, 11, 169 (corrections 4, 1, 52)
Multiline Delete, 3, 4, 144
Padcalc (16K), 3, 9, 173
Progaid (see corrections 4, 4, 44 and 4, 5, 42), 4, 3, 151
Quickload, 3, 6, 75
Renumber, 3, 11, 153
Selfdelete, 4, 3, 182
Speech (corrections 4, 6, 43), 4, 5, 125
Sprite Maker (see corrections 4, 11, 40), 4, 9, 116
Tape Verify, 3, 5, 65
Text Editor, 4, 6, 165
Unifile, 3, 4, 66 (see corrections 3, 6, 45)
Word Processor (16K), 2, 10, 52
ZX81 – Spectrum Converter, 3, 12, 170
Voice Recognition 4, 10, 143

HOT FROM

SEGA®

THE ARCADE WINNERS

U.S. Gold is stocked by
John Menzies, WILDINGS
WOOLWORTH, WHSMITH,
Rumbelows
and Spectrum Shops

released
NOW

SPY HUNTER

THE OFFICIAL HOME VERSION OF BALLY MIDWAY'S ARCADE HIT

- You control the turbo charged race car/hydro spy boat.
- You control a deadly arsenal of missiles, machine guns, oil slicks and smoke screens.
- Sophisticated spy-challenging graphics.

64
COMMODORE CASSETTE 9·95
DISK 12·95

SPECTRUM CASSETTE 7·95

For release schedule and trade details contact:
Centre Soft, Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Telephone: 021-359 3020. Telex: 337268.

TAKE A TEST FROM THE RANGE

So now you have got your home computer, you're ready to talk to Cumana – the best name in memory. Already a market leader throughout Europe for their range of disk drives, Cumana now have other products on offer all to the same exacting standards that have made their disk drives the number one choice in the home and in education.

The Touch Pad

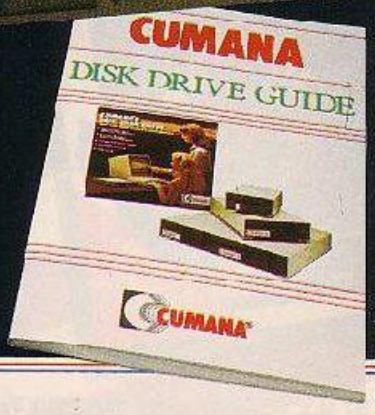
The Touch Pad is a low-cost graphic plotting aid for the BBC micro. This compact display cursor moving device simplifies programming with the touch of the stylus.

The product comes complete with an instruction booklet, basic software, stylus and connecting cable. Its uses are in graphics, computer aided design, education and games.

£69.95
including VAT.

BE SAFE NOT SORRY

Cumana's CS range of single disk drives have been subjected to the strict safety demands of the BEAB.
They have now been awarded BS415 approval, so if you value safety do not trust it to anything less than Cumana.
Cumana's dual range of disk drives have also been submitted for approval.



Disk Drives

Cumana have spent years on research, development and marketing a range of drives second to none. Their drives are compatible with BBC, Spectrum, Dragon, Oric, Tandy Models III and 4 and Video Genie. They are fully guaranteed for 12 months and approved for electrical safety by the D.M.E.E. and are extensively used in GLC and ILEA establishments. Cumana were the first independent disk drive supplier and are now Europe's market leader. Their products have been proven in the schools, universities and homes throughout Europe. Let us drive you in the right direction, send now for further details of the Cumana range, or see them at our distributors and at selected branches of W.H. Smith, Lasky's, Greens, Currys, and Spectrum UK.

DRIVE CUMANA

The Acorn Electron Computer
A microcomputer with a proven track record. Using BBC Basic, the Electron was developed out of the Micro that has been chosen for over 80% of schools participating in the Government's current Micros In Schools project. It connects into almost any TV set and cassette player and is supplied with a comprehensive User Guide which runs through, in a simple to follow manner, the basic principles of programming. A wide range of software is available, including games, educational packages and home accounts.

Cumana price
£199.00

Disk interface now available for the Acorn Electron details from Cumana.

Diskettes
Only when Cumana found a double density diskette up to their stringent quality control requirements, and at a price that made sense to the end user, were Cumana ready to put their name to it.

The result was a top quality diskette, complete with a plastic protective case for the ten-pack (they are also sold in two-packs!) together with index stickers.

Cumana diskettes are available now in both 5¼ inch and 3½ inch as single or double-sided, 40 or 80 track, from your local computer dealer. Don't trust it to chance, go for the best name on record.

Cumana BBC Microcomputer compatible disk drives: retail price list.

Cumana disk drives supplied with formatting diskette, drive connecting cable and Cumana user guide. Independent power supply, mains lead and moulded plug included.

CS100 40 Track single sided (100K)	£159.95
CS200D 40 Track double sided (200K)	£203.95
CS200 80 Track single sided (200K)	£192.95
CS400 80 Track double sided (400K)	£219.95
CD200 2 x 40 Track single sided (200K)	£284.95
CD400D 2 x 40 Track double sided (400K)	£381.95
CD400/S 2 x 80 Track single sided (400K)	£359.95
CD800/S 2 x 80 Track double sided (800K)	£414.95

Cumana disk drives with independent power supply, mains lead and plug. Excluding other accessories.

CS100E 40 Track single sided (100K)	£149.95
CS200ED 40 Track double sided (200K)	£192.95
CS200E 80 Track single sided (200K)	£180.95
CS400E 80 Track double sided (400K)	£208.95

Cumana disk drives supplied with formatting diskette and Cumana user guide. Power supply taken from BBC Microcomputer, with lead supplied.

CSX100D 40 Track single sided (100K)	£119.95
CSX200D 40 Track double sided (200K)	£165.95
CSX200 80 Track single sided (200K)	£159.95
CSX400 80 Track Double sided (400K)	£189.95
3½ INCH DRIVES	
CSX351 40 Track single sided (100K)	£139.95
CSX354 80 Track double sided (400K)	£199.95
CDX352 2 x 40 Track single sided (200K)	£256.95
CDX358 2 x 80 Double sided (800K)	£383.95

The 'X' range takes its power from your microcomputer.

CS351 40 Track single sided (100K)	£169.95
CS354 80 Track double sided (400K)	£229.95
CD352 Dual 40 Track single sided (200K)	£299.95
CD358 Dual 80 Track double sided (800K)	£429.95

The 'CS' range comes complete with power supply.

DISTRIBUTORS/RETAIL

Available from the following retail outlets: W.H.Smith, John Lewis Partnership, Greens Leisure, Laskys, Spectrum UK.

Area distributors:
Addons Ltd (Southampton) 0703 34775/6. Audio & Computer Centre Ltd (Jersey) 0534 71030. Eltec Home & Business Computers (Bradford) 0274 722512. Fairhurst Instruments (Wilmslow) 0625 525694. HCCS Associates (Gateshead) 0632 821924. Hugh-Symons Distribution Services Ltd (Bournmouth) 0202 26535. Kingdom Design (Belfast) 0232 643720. Lightning (Harrow) 01 969 5255. Microage Distribution Ltd (North London) 01 205 7688. Microworld (Edinburgh) 031 228 1111. National Micro Centre (Stockport) 061 429 8080. Northamber PLC (Chessington). Silicon Express (Leicester) 0533 374917. Thompson Cook Distribution Ltd (Birmingham) 021 328 3895. J. S. Simrett Computers (Kingston-upon-Thames) 01 541 1495.
+ National Dealer Network

CUMANA®

Cumana Limited, Pines Trading Estate, Broad Street, Guildford, Surrey. GU3 3BH
Telephone 0483 503121

All Prices Inclusive of VAT. All 80 Track 5¼" Drives are Switchable to 40 Track Mode

YOU MARVELLED AT BEACH-HEAD...

NOW ACCESS PRESENT THEIR LATEST MASTERPIECE:

RAID OVER MOSCOW

commodore 64

The most breathtaking 3-D graphics yet seen on the Commodore 64!

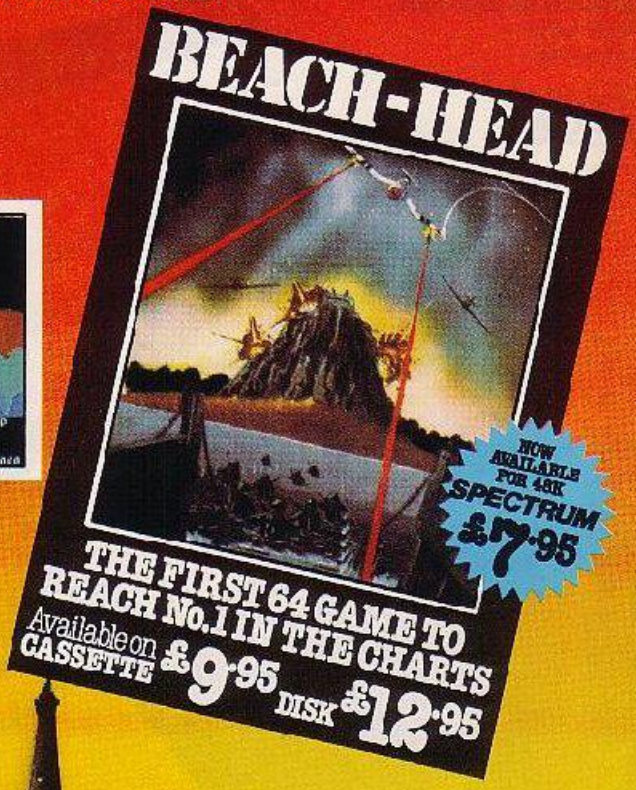
Gripping arcade action

Multiple scrolling screens

The Soviets launch a nuclear strike against major cities in the United States and Canada. With our own nuclear arsenal dismantled, in accordance with the Salt IV Arms Agreement, the Soviets believe their treachery will lead to total world domination. Our only hope is our space station equipped with stealth bombers, which can fly undetected in Soviet airspace.

As squadron leader you must lead your commandos on a virtual suicide mission, knock out the Soviet launch sites, and then proceed into the city of Moscow. Armed with only the weapons you can carry, you must seek and destroy the Soviet defence centre to stop the attack! Top multi-screen action!

Available on CASSETTE £9·95 DISK £12·95



U.S. GOLD
All American Software

U.S. Gold is stocked by all leading computer stores including:
BOOTS WH SMITH JOHN MENZIES
WILDINGS WOOLWORTH

Dealers! For information on how to become a U.S. Gold Stockist write to: CentreSoft, Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Telephone: 021-359 3020. Telex: 337268.

THE TYPING MASTER

(The Keyboard Skills program that puts you in a class of your own)

● **'The Typing Master'** program exists to teach you to type. The easily met target is 30 words per minute with 95% accuracy after 30 half-hour sessions. The following facilities help you to accomplish this standard.

● **'Sight & Type'** introduces you to the keyboard with the correct finger for each key and takes you to a speed of around 12 words per minute.

● **'Touch-Typing'** takes your speed to around 24 words per minute at the same time ensuring that you learn the peripheral keys to the same standard as those more commonly used.

● **'Practice Exercises'** gives Non-Timed accuracy oriented exercises and Timed speed/accuracy exercises. Your results are given in words per minute and percent accuracy. The target standard of 30 words per minute (and far beyond) is achieved with this module.

● **'Session Monitor'** overlays the whole program to hold your hand all the way through the course from first use of the program to that final, very useful result.

● To back up this Basic version you get documentation on how to approach the course and a record card to fill in as you progress through the sessions.

● **'The Typing Master'** is not a toy. It is a professionally-written program which has as its sole purpose the teaching of typing/keyboard skills in a way that is friendly and fun. It was written by a typing instructor and it has been marketed world-wide on CP/M, MSDOS, PCDOS and other operating system-based machines over the past three years. It has also been available on Newbrain and BBC Micro (Model A or B) for over a year and is now being released for Amstrad CPC (mono or colour), Commodore 64 and Sinclair QL!

● TAPE formats of the Basic version are available from the following selected list of distributors (media and prices are shown in brackets).

NEWBRAIN (Cassette: £15.00 (no VAT)):
GFG Microsystems, 36 Armitage Way, King's Hedges, Cambridge, CB4 2UE. Tel. (0223) 315120.

BBC MICRO (model A or B) (Cassette, usable with disk: £15.00+VAT)
AMSTRAD CPC (mono or colour) (Cassette: £15.00 + VAT).
E.C.H. Hobday, The Chestnuts, Rodmersham, Sittingbourne, Kent ME9 0PL. Tel. (0795) 24191.
COMMODORE 64 (Cassette: £15.00 + VAT).
SINCLAIR QL (Cartridge: £20.00 + VAT).
P. Ashpitel, 36 Athlone Avenue, Bury, Lancashire, BL9 5EE. Tel. (061-797) 5214.

Please send me_____copies of **THE TYPING MASTER (Basic Version)**

for the _____computer at £_____per copy (+VAT where shown). I enclose cheque/postal order for total amount:

£_____

NAME:_____

ADDRESS:_____

PLEASE SEND THE COMPLETED COUPON AND PAYMENT DIRECT TO THE DISTRIBUTOR FOR *YOUR COMPUTER* AS SHOWN ABOVE.

● DISK formats of the Basic program may be obtained from the following suppliers. They also supply a Business/School version which incorporates record keeping and many other facilities. Prices shown below are for the Basic version.
APRICOT, SIRIUS & VICTOR (tailored versions). (Disk: £50.00 + VAT).
Anglia Business Computers, 1 Milton Road, Cambridge, CB4 1UY. Tel. (0223) 315380.
CP/M80, CP/M86, MSDOS, PCDOS. (Disk: £50.00 + VAT).
Microcomputer Products International Limited, Central House, Cambridge Road, Barking, Essex, IG11 8NT. Tel. (01-591) 6511.
or,
Software Limited, No. 2 Alice Owen Technology Centre, 251 Goswell Road, London, EC1. Tel. (01-833) 1173.

In case of difficulty contact:

ANTHONY ASHPITEL SOFTWARE SYSTEMS
56 London Road, Harleston, Norfolk, IP20 9BZ, England. Tel. (0379) 852807 (answer phone).

BETA BASIC 1.8

ENHANCED BASIC FOR SPECTRUM 48K
FOR GRAPHICS – STRUCTURED PROGRAMMING – DATA HANDLING

Release 1.8 is more powerful than ever! We don't have space to do this program justice – if you can't believe the ad, send us a large S.A.E. for further information.

Features: Commands are single-entry keywords in graphics mode. Syntax is checked on entry. Fully compatible with Spectrum Basic. Microdrive compatible. Comprehensive manual.
NOTE: Release 1.0 is still available for 16/48K Spectrum at £11.00.

ALTER screens colours (general or specific)
AUTO line numbering
BREAK out of code loops
CLOCK digital clock
CURSOR CONTROL CODES allow strings to have complex shapes
DEF KEY user definable keys
DELETE a block of lines
DO...LOOP structure
DPOKE double poke
EDIT specified line
ELSE (used with IF...THEN)
EXIT leave DO-LOOP
FILL enclosed area with specified ink or paper
GET wait for keypress
JOIN two program lines
KEY! a string
KEYWORDS new keywords on/off
LIST/LLIST line TO line
USED (used with GOTO, GOSUB)
ON ERROR trap errors (with LINE, STAT and ERROR)
PLOT a string (may contain cursor control codes)
POKE a string
POP Basic's stack
PROC, DEF PROC, END PROC (for named procedures)
RENUM versatile renumber
ROLL all or part of screen in any direction by specified number of pixels, with or without attributes
SCROLL like ROLL, but without wrap-round
SORT arrays (very fast)
SPLIT program lines
TRACE program execution
UNTIL used with DO or LOOP
USING used with PRINT
WHILE used with DO or LOOP
XOS, YOS move PLOT origin
XRG, YRG change PLOT scale

FUNCTIONS

AND (bit by bit)
BIN# decimal to binary
CHAR$ number to 2 characters
COS# fast cosine
DEC hexadecimal to decimal
DPEEK double PEEK
FILLED filled area
HEX$ decimal to hexadecimal
INSTRING string search
MEM free memory
MEMORY$ all of memory as a string
MOD modulus
NUMBER 2 characters to number
OR (bit by bit)
RND# fast RND
SCRN$ recognises user graphics
SIN# fast sine
STRING$ repeats strings
TIME$ current time
USING$ formats numbers
XOR (bit-by-bit)

Only £11.00 inclusive! (Upgrade price for Release 1.0 owners is £4.00. This includes a 12-page supplement to your manual. Please quote date of purchase. If you did not purchase from us, state supplier and return original cassette.)

Please send me:
Beta Basic, Release 1.8 Payment of £11.00 is enclosed.
(or £11.50 for foreign orders). Cheques payable to BETASOFT.

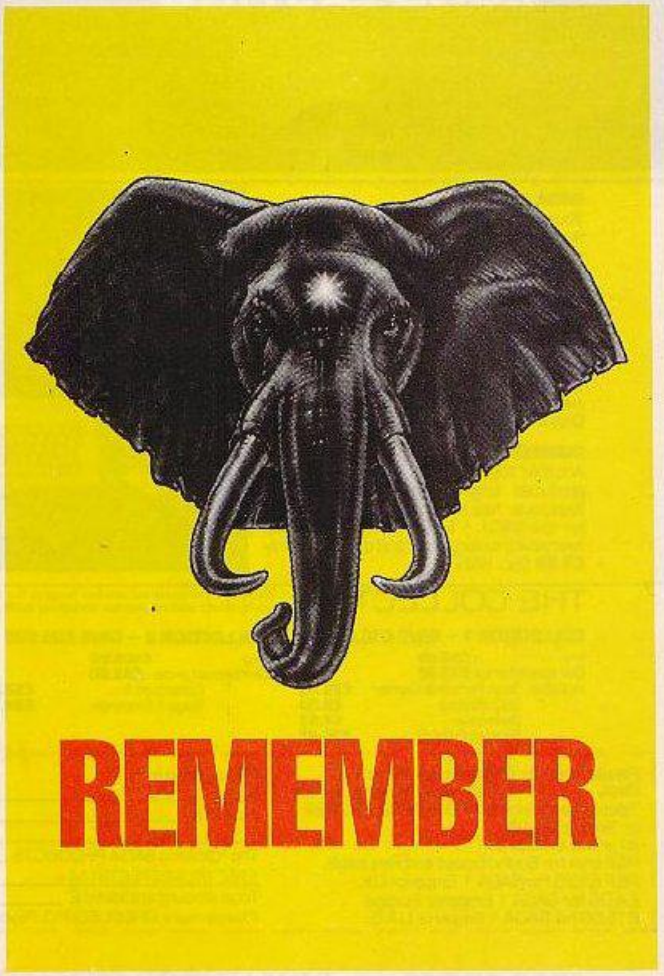
I don't believe it! Please send me full details of Beta Basic 1.8. I enclose a stamped addressed envelope.

NAME: . . . . . .

ADDRESS . . . . . .

. . . . . .

BETASOFT
92 OXFORD ROAD, MOSELEY, BIRMINGHAM B13 9SQ.



SAGA 1 EMPEROR

Sheer Elegance

AVAILABLE NOW

THE KEYBOARD FOR ZX SPECTRUM COMPUTERS

- **EASY FITTING**
- **PLEASURE TO USE**
- **LONG LASTING**

The Saga 1 Emperor, equipped with 67 keys, is a carefully designed replacement keyboard incorporating many special functions for the popular Spectrum Computer. For business or pleasure, the Emperor will make your computing time more productive and enjoyable. The SAGA 1 Emperor will enable you to use the Spectrum as a powerful programming tool easier and faster.

The style is easy:- for your benefit, the SAGA 1 Emperor has been designed to ensure that available Spectrum Peripherals will fit in the usual manner.

The assembly of the keyboard is simple and fast. No soldering required, so that within just 5 minutes you can replace your current ZX Spectrum with the new SAGA 1 Emperor.

AND ALL THIS FOR JUST £54.95 (inc. VAT)

SAGA P.C.!

Your very own Personal Carrier, partitioned to neatly accommodate your Spectrum, Saga 1 Emperor and peripherals; Tape Recorder, Power Supply, Cables, manuals and cassettes. Of solid and attractive construction the P.C. is ideal for storing and transporting your computer accessories. The case uses a strong double stitched and bound Black Calf Vinyl with a tough thick ABS inner compartment, leather buckles and a strong handle. Only **£26.95** (inc. VAT).

DUSTCOVER

Another top quality product, this expertly produced long-lasting bound and sewn dustcover has been specifically designed for the SAGA 1 Emperor, which will keep everything looking neat and dust free. Only **£4.95** (inc. VAT).

SOUNDBOOST

Hear that keyboard click ... with a SAGA SOUNDBOOST

The SAGA SOUNDBOOST is a tiny electronic circuit which considerably enhances the sound volume and quality of the Spectrum sound output. Adjustable from a whisper to a roar, the SOUNDBOOST provides added realism and excitement for games players and security for programmers (Hear that Keyboard Click!). No cutting, no soldering – just connect.

Only **£9.50** (inc VAT).

FLEXICABLE

Developed to relieve your Spectrum from the pressure of life, to fit your Spectrum and your add-ons taking the load with ease. By popular demand we now have two versions of the 9 inch FLEXICABLE available to suit your needs.

Male-Female FLEXICABLE – £12.45
Female-Female FLEXICABLE – £9.60
Convertor PCB – £2.95

THE COLLECTION

The latest addition to our product range is 'The Collection', providing you with three money saving action packed specials containing quality products – an ideal gift.

COLLECTION 1 – SAVE £10.00!!

rrp	£53.85
Our special price	£43.85
Includes: Saga Personal Carrier	£26.95
Soundboost	£9.50
Dustcover	£4.95
Flexicable (M-F)	£12.45

COLLECTION 2 – SAVE £20.00!!

rrp	£108.80
Our special price	£88.80
Collection 1	£53.85
Saga 1 Emperor	£54.95

COLLECTION 3 – SAVE £30.00!!

rrp	£238.75
Our special price	£208.75
Collection 2	£108.80
48K Sinclair ZX Spectrum	£129.95

DISTRIBUTOR & TRADE ENQUIRIES CALL NOW ON WOKING (04862) 22922

Please write to SAGA Systems Limited, Dept. 2 Eve Road, Woking, Surrey
Telephone Woking (04862) 69527/22922 or Telex 859298
All prices include VAT
P&P free for Sound Boost and Flexicable.
P&P £1.25 for SAGA 1 Emperor U.K.
£4.00 for SAGA 1 Emperor Europe
£15.00 for SAGA 1 Emperor U.A.E.

Please send me
Name _____
Address _____
The following SAGA PRODUCTS _____
SPECTRUM/SPECTRUM + _____
Total amount enclosed £ _____
Please make CHEQUES/P.O. Payable to SAGA Systems Ltd.

SSL

STOP PRESS . . . REMAINDER STOCK CLEARANCE SAGA P.C. SLASHED £14.95
STOP PRESS . . . SAGA 1 EMPEROR ALSO COMPATIBLE WITH SPECTRUM + NEW PRICE £49.95 + P&P. STATE FOR WHICH MACHINE.

RSD Connections Ltd

CONNECTORS IDC

	Card Edge	(Transition) PCB	2 Row Socket
10-way	£1.20	£0.85	£0.60
14-way	—	—	£0.90
16-way	£1.60	£1.20	£1.00
20-way	£1.90	£1.35	£1.20
26-way	£2.40	£1.60	£1.45
34-way	£3.10	£1.95	£1.60
40-way	£3.40	£2.00	£1.85
50-way	£3.85	£2.25	£2.00
60-way	£4.80	£2.60	£2.25

IDC SHROUDED HEADERS WITH EJECTING LOCKING ARMS

	Straight	Right Angle
10-way	85	90
14-way	£1.00	£1.20
16-way	£1.25	£1.45
20-way	£1.40	£1.60
26-way	£1.70	£1.95
34-way	£2.00	£2.30
40-way	£2.15	£2.45
50-way	£2.30	£2.65
60-way	£2.45	£2.85

IDC D CONNECTORS

	Male	Female
9-way	£2.70	£3.20
15-way	£3.20	£3.70
25-way	£3.80	£4.45
37-way	£5.50	£6.30

IDC AMPHENOL (Centronics)

36-way plug	£4.95
36-way socket	£5.95

PRINTER LEADS

ALL 1 METRE LENGTH

BBC	£9.95
BBC serial	£8.55
AMSTRAD	£16.75
MEMOTECH	£12.75
EINSTEIN	£12.75
IBM PCC	£15.55
SPECTRUM interface 1 to RS 232	£9.75
SPECTRUM interface 1 to Centronics	£10.75
CENTRONICS to Centronics	£15.20
DRAGON	£9.55
QL	£10.75

COMPUTER LEADS

Dual disk drive 1m	£10.25
Single disk drive 1m	£7.25
7 pin DIN plug to 2x3.5mm 1x2.5mm Jack plugs	£2.25
5 Pin DIN plug to 2x3.5mm 1x2.5mm Jack plugs	£2.20
6 Pin DIN Plug to 6 Pin DIN Plug	£1.95
2x3.5mm Jack plugs to 2x3.5mm Jack plugs	£1.25
7 Pin DIN plug to 5 pin DIN plug	£1.95
7 Pin DIN Plug to 3 pin DIN plug and 2.5mm Jack plug	£2.25
7 Pin DIN plug to 7 Pin DIN plug	£2.25
5 Pin Domino Plug to 5 pin Domino plug	£1.95
Phono Plug to Coaxial TV Aerial plug	95p

D CONNECTORS

	Solder Bucket	Male	Female
9-way		.75	£1.00
15-way		.95	£1.50
25-way		£1.50	£1.90
37-way		£2.40	£3.25
100C5	£.95		

DIP HEADERS

Pins	
14	90p
16	£1.00
24	£1.40
28	£3.95
40	£2.15

EDGE CONNECTORS

2x23-way (ZX81)	£1.85
2x28-way (Spectrum)	£2.10
2x5-way Commodore	£1.20
2x12-way	£1.60

DOUBLE SIDED PLUG BOARDS

2x11-23-way	£1.25
Spectrum 28-way	£1.50

RIBBON CABLE (Price per ft)

	Grey	Rainbow
9-way	.13	.24
10-way	.15	.28
14-way	.18	.32
15-way	.20	.36
16-way	.22	.40
20-way	.30	.50
24-way	.36	.60
25-way	.40	.65
26-way	.45	.70
34-way	.60	.80
37-way	.65	.85
50-way	.70	.90
60-way	.95	£1.25
64-way	£1.15	£1.50

TELEPHONE CONNS

Surface master jack socket	£3.75
Surface extn socket	£2.50
Dual outlet adaptor	£4.25
Line jack cord 3mtr	£1.85
BT jack plug	48p
4 core cable per metre	15p

All surface units shuttered BT approved.

QL to Ferguson	£2.50
BBC to Ferguson	£2.50

MONITOR LEADS

BBC 6-pin to scart plug	£4.95
BNC plug to phono plug	£2.95
QL to colour monitor	£4.95
QL to mono monitor	£1.25

BBC JOYSTICK DELUXE
JOYSTICK for BBC MICRO. Fits directly into BBC Micro analogue port
£12.95

SPECTRUM EXTENSION LEADS

6 inch extension cable M to F	£10.50
6 inch F to 2M's	£14.75
12 inch extension cable M to F	£10.75

Other configurations made to order
Write or phone for quote

CUSTOM ASSEMBLIES

ANY COMBINATION OF LEADS MADE TO ORDER

TRADE ENQUIRIES WELCOME

Please add 15% VAT

Free p&p C.W.O. or use

RSD Connections Ltd., Dept YC2, PO Box 1, Ware, Herts
Telephone: 0920 5285
Formerly COMPUTER LINK UK LTD

THE MICRO WORKSHOP

MICRO COMPUTER SPECIALISTS

(Spectrum Group Member)

Software and hardware over the counter for Sinclair Spectrum, ZX-81, BBC,. Vic-20, CBM-64, Memotech, Amstrad, etc.

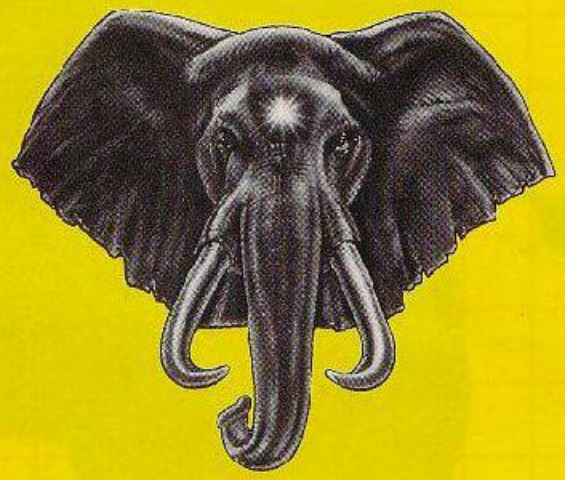
* COMPUTERS
* RAMPACKS
* JOYSTICKS
* BOOKS
* KEYBOARDS
* DISCS
* TAPES
* LIGHT PENS
* COMPONENTS *

Business/Serious Programs available

Located directly opposite Epsom Main Line Station. Visit us or ring for friendly service. See and try before you buy.

Overseas/Export orders welcome

12 STATION APPROACH
EPSOM, SURREY.
EPSOM 21533



ELEPHANT NEVER FORGETS

ELEPHANT MEMORY SYSTEMS

The talk of Britain's computers.

The Protek 1200 Modems bring you high speed computer to computer communication coupled with the ability to receive and transmit to data bases set up for the 1200/75 Baud International Standard e.g. Prestel and B.T. Gold. The Modems will improve your business communications at a very low cost. . . . From £59.95 the Modems are available in two models.

Mark I—1200/75 Full Duplex: 1200/1200 Half Duplex **£59.95.**

Mark II—1200/75 Full Duplex: 1200/1200 Half Duplex including line turnaround facility **£79.95.**

You will find that they are the cheapest acoustic Modems on the market. No modifications to your telephone are necessary because the Protek 1200 Modems are designed to fit most standard telephones except trimphones.

Added to this the computers linked by Modems need not even be the same. The Modems are compatible with all computers using the industry standard RS232C interface supporting a split Baud rate.

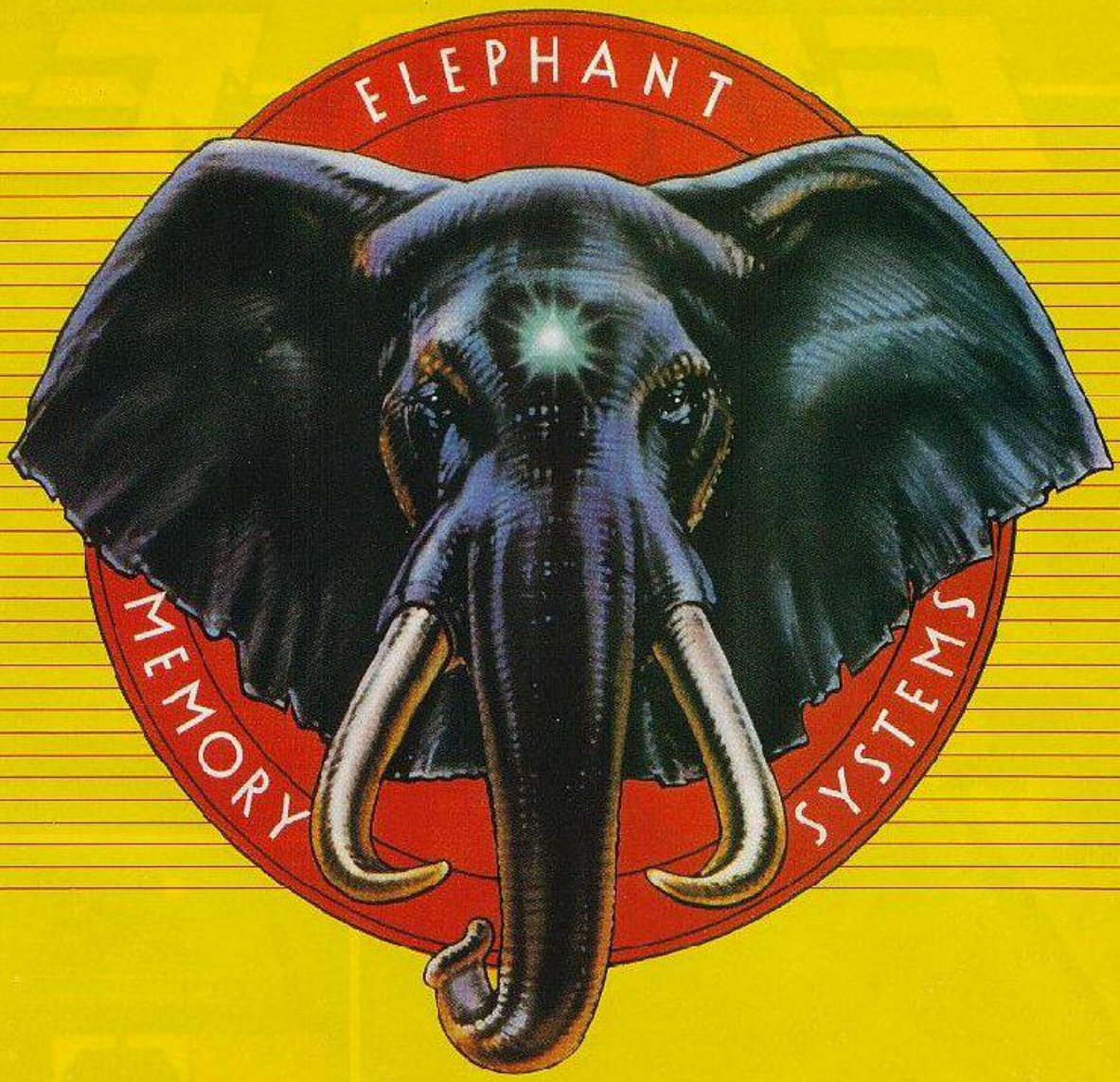
Fully portable, simply operated by 4 AA batteries with LED indicator—all you have to do to make contact is dial.

APPROVED for use with telecommunication systems run by British Telecommunications in accordance with the conditions in the instructions for use

Protek

Protek Computing Ltd, 1A Young Square,
Brucefield Industrial Park, Livingston, West Lothian, 0506 415353. Telex No. 727559.

REMEMBER



ELEPHANT NEVER FORGETS

Get the best from your computer with ELEPHANT disks. Certified 100% error-free and problem-free, and with quality maintained for at least 12 million passes, ELEPHANT disks are guaranteed to meet or exceed every industry standard and are compatible with virtually every computer on the market.

Look for the ELEPHANT sign at your local Dealers – or in case of difficulty, phone or write direct to Dennison Manufacturing Co. Ltd.

Dennison

Dennison Manufacturing Co. Ltd.
Colonial Way, Watford Herts WD2 4JY, Tel: Watford (0923) 41244, Telex: 923321
France: Sorodiser, 8, Rue Montgolfier - 93115, Rosny-Sous-Bois, Tel: 16 (1) 855-73-70
Germany: Marcom Computerzubehoer GmbH, Podbielskistr. 321, 3000 Hannover 1, Telex: 923818
Other Countries: Dennison International Company, 4006 Erkrath 1, Matthias-Claudius-Strasse 9, Telex: 858 6600

Multiple Combat Scenarios
Full Aerobatics
3-D Graphics

F-15 STRIKE EAGLE

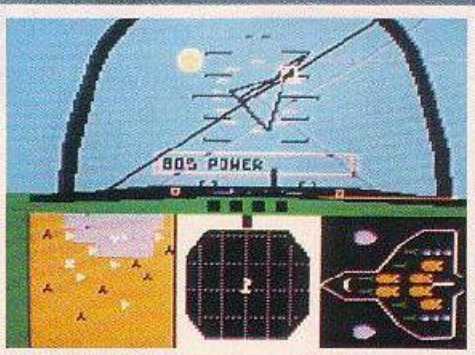
U.S. GOLD
All American Software

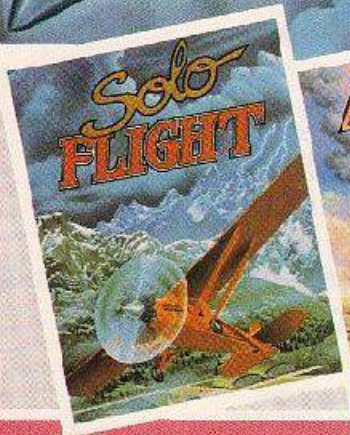
MicroProse Software

64 ATARI

F-15 Strike Eagle features superb 3-D graphics, F-15 manoeuvreability, computer assisted targetting including modern fighter Heads Up Display, airborne radar, air to air missiles, surface to air missile defence, ground target bombing, full aerobatics, and multiple combat scenarios.

DISK/CASSETTE £14.95





SOLO FLIGHT: Take off with this user friendly flight simulator which includes 3-D graphics, full cockpit instrumentation, dual VORs, ILS, 21 different airports, and real life challenges from weather and mechanical emergencies. **DISK/CASSETTE £14.95**

SPITFIRE ACE: Save London during the Blitz in your RAF Spitfire! Outstanding out-of-the-cockpit 3-D graphics; 14 different combat senarios. **DISK £12.95, CASSETTE £9.95**

NATO COMMANDER: Defend Europe in an accelerated real-time war situation! Full scrolling battle map, includes infantry, armour, helicopters, airforces and tactical nuclear weapons. **DISK £12.95, CASSETTE £9.95**

U.S. Gold is stocked by all leading computer stores including: Boots / John Menzies WHSMITH WILDINGS WOOLWORTH

U.S. Gold Limited, Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Telephone: 021-359 3020. Telex: 337268.

YOUR COMPUTER CLASSIFIED

01-661 3036

Contact: Susan Platts

ADVERTISEMENT RATES

Copy Date March 25th

Lineage: 50p per word
(Min 20 words)
Box No: £4.00 extra
Linage advertisements are prepayable and the order form published in this section should be completed and returned with remittance. Credit Card facilities are available.

Display — rates per scc (Min. 2scc)

One insertion	:	£9.00
Three insertions	:	£8.70
Six insertions	:	£8.50
Twelve insertions	:	£8.00

Display advertisers should preferably reserve space by phone.

Closing date for Classified advertisements is the 25th March for the May edition

Post to
Your Computer, Classified Department, Room H211, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Britain's Biggest Selling Home Computer Magazine

SINCLAIR SERVICE CENTRE

We have the spares for all repairs to: Spectrum, ZX81 Printer and RAM Pack. You pay £10.00 plus parts and return postage. All units repaired to original Standard using genuine Sinclair Spares by our H.N.C. qualified staff. Also available Spectrum Memory Update 16K-48K fitted by us £28.50.

QUANTUM, 33 City Arcade, Coventry or Phone Coventry (0203) 24632. 565

VIC-20 USERS!

Cartridge and Cassette Backup (6 ways) to tape or disc using the VICTRIX data booklet. Also contains information on adding RESET, SLOT POWER & WRITE PROTECT switches to your VIC-20.

Send £3.49 and 50p p&p
M. Parker, 52 Laurie Avenue, Forest Fields, Nottingham Ng8 1DY.
(Mail Order only please) 579

WAFADRIVE-MICRODRIVE TRANSFER TAPES

Transfer majority of your games to a WAFADRIVE or a MICRODRIVE using the 007WD or 007MD tapes. These use the Semi-Automatic method which has been proved to be the MOST successful. Includes transferring of Headerless programs & programs in map area.
The Wafadrive 007WD includes system to greatly reduce Loading time for multipart programs.
Longer programs can be transferred to WAFADRIVE or MICRODRIVE using the technique printed in Newsletters of MICRODRIVE-EXCHANGE club . . SCRABBLE, LORDS OF MIDNIGHT being two examples.

007WD or 007MD on cassette
£5.95

(Europe + 50p Others – £1.50)

MICRODRIVE-EXCHANGE NEWSLETTER CLUB. Membership is just £6 for 12 monthly issues (£8 Europe, £12 elsewhere). Includes transferring VU-FILE/CALC. 552

ZX-GUARANTEED (YC)
29 Chadderton Drive, Unsworth, Bury, Lancs. BL9 8NL. Tel. 061-766 5712

WDSoftware

Utilities for the QL (£10 on Microdrive)
This package offers single-key loading, running or deletion of files, multiple formatting of cartridges, and auto backup of files from one or more cartridges to another with optional over-writing of namesakes. In addition, a directory of 60 + files can be viewed without screen overflow. NB a VERIFY program is unnecessary — QDCS does this automatically. Now includes directory print-out and 'qprint' to print any or all files on a cartridge with optional dated titles. Owners of the earlier package can update by sending OUR cartridge and 25p.

Morse Tutor for QL £8.50
As for 48K Spectrum without speech
Current Spectrum Software
Tradewind (£5 Cassette)
Buy a ship, provisions and cargoes to trade between the harbours of the Coral Islands. Make a fortune if the weather and pirates let you live long enough to master seamanship and economics. A strategy/adventure game with graphics for 48K.

Jersey Quest (£5 Cassette)
Following an accident, you are stranded in the labyrinth of time and must find your own way back to the present with the aid of persons and objects from Jersey Folklore. Meet the Black Horse of St Quen, the Dragon and Knight of La Hougue Bie, the Black Cat of Carrefour a Cendre, the Witches of Rocqueburg and many others. A text-only adventure for 48K in machine code (Quill).

Morse Tutor (£4 Cassette)
The one has it all! 4-19 words/minute, variable spacing, variable number of groups of random letters numbers or mixed, random sentences, own message, single characters (including punctuation), variable pitch, FEEDBACK via screen, printer or SPEECH (phonetic alphabet via Currah u/Speech on 48K version only), and repeat facility. Takes you to and beyond RYA and Amateur Radio receiving standards. 16K and 48K versions on one cassette. 48K only on Microdrive cartridge.

Spectrum Programs on Microdrive
All the above are available on Microdrive cartridges at a price of £4.50 for one cartridge + the price of each program as shown above. E.G., a cartridge with Tradewind and Morse Tutor would be £7.50. As a bonus, Gavin Monk's Indexed Loader is included free with each cartridge.

available from
WDSoftware, Hilltop, St. Mary, Jersey, C.I. Tel (0534) 81392
558

MUSICAL software. Play the guitar, reading music, rhythm synthesiser. £5 each. 48K Spectrum. SAE for details. Scott Massie, No. 1, Bungalow, Firlands, Burghfield Common, Berks. 464

Join The Commodore 64 Cassette Library

1. All the latest cassette based Software.
2. Only one price to hire; £1.50 per cassette, inc. p&p for full 7 days.
3. No charge on hire of first game.
4. Membership charge £6.00 only.
5. Quick postal return.

Send cheque or postal order for £6.00 membership fee, or large SAE for further details to:

Commodore 64 Cassette Library
19 Darrell Way
Abingdon OX14 1HQ.
Tel. No. 0235 27769 529

* UNLOCK YOUR AMSTRAD * Amskey

EASY TO USE utility program. Removes protection and allows listing, studying and copying of your precious software.

YOU CHOOSE loading speed and protection of your back-up copies.

Only £6.99 incl. p&p. Overseas please add £1.00 postage.

Interlock Services Ltd.
37B New Cavendish St,
London W1M 8JR.
Tel. 01-609 8301

U.S.A. — C-64 User Group would like to exchange software and ideas with European groups or individuals. Prefer disk, but will consider tape. Respond to: Metro-Area Commodore Club, Box M, Mendota, Minnesota, 55150 — U.S.A. Or call: (612) 778-8188. 572

VIC-20/CBM SOFTWARE HIRE
Free membership!
Dozens of titles (e.g. 3D Time Trek, Pharoah's Tomb) from 60p per week. Send SAE for your Hirekit to:
Vic-20 Software Hire (YC)
242 Ransom Road, Mapperley, Nottingham.
State which machine please 408

MICRODRIVE TRANSFER TAPE

At last **MAJORITY** of your software can be transferred to Microdrive, even auto-start commercially made games **WILL** run as intended.

* The **NEW 007 MD** cassette enables you to transfer the Headerless programs as well.
* Includes an intelligent Header Reader which tells **YOU** if any special actions required.
* Does **NOT** require an additional Help tape.
* Semi-Automatic. Fully automatic systems have proved limited.

How it works: Copies Code to the Microdrive using its push-button copier. **YOU** make a few very easy changes to the Basic loader part. Save it to Microdrive, and magic, **INSTANT SUCCESS.**

007 MD IS JUST £5.95
(Europe + 50p Other areas + £1.50)

SPECIAL OFFER: Membership of the **MICRODRIVE EXCHANGE** Newsletter club plus 007 MD for just £10. (Or on cartridge for £15).

393

ZX-GUARANTEED (Dept YC)
29 Chadderton Drive, Unsworth, Bury, Lancs. BL9 8NL
Tel: 061-766 5712

HOME ACCOUNTS. Put your house in order! Probably the best home use for your computer! Comprehensive coverage of bank accounts, credit cards, HP, etc. Built accuracy check for all transactions. Project cashflow for any period ahead. Available for CBM 64 or VIC-20 £7.50 or free details from: DISCUS SOFTWARE, FREEPOST, Windmill Hill, Brixham TQ5 9BR. Tel: 08045 56632. 477

IMPROVE YOUR PROSPECTS

with skills that employers want – learn the easy way with modern home study courses from Ideal Schools.

MODERN ELECTRONICS
Train for success in the fastest ever growing industrial sector.

COMPUTER PROGRAMMING
The demand for Programmers is increasing constantly – don't miss out!

For free booklet write today to

IDEAL

IDEAL SCHOOLS
(Ref. YC5)
60 St. Enoch Sq
Glasgow G1 UK.
Tel: 041-248 5200

402

AMSTRAD SOFTWARE in ROM!

MAXAM

Meet MAXAM — a new full-feature no-compromise Assembler/Disassembler/Editor — with a difference. It's in a very full 16K EPROM which plugs directly into the AMSTRAD. No waiting while it loads — it's always there. You can still use the Disc unit. You also get, as a bonus, a new expansion socket for Arnor's range of Sideways ROM cartridges (containing, for example, our forthcoming Word Processor).
MAXAM uses no BASIC RAM space. It lets you mix BASIC and Machine Code — just like the BBEB. Or, you can assemble direct from the Editor, and you can even use the Editor to edit BASIC programs.
MAXAM is ESSENTIAL software for the serious AMSTRAD user.

MAXAM, including Adaptor: £59.90. On Cassette (simplified): £13.50. On Disc (full-feature): £26.90. Prices include postpacking. Full handbook supplied.
Order Hotline 01-653 1483 (2pm-6pm).

Technical Data

*Super-fast 3000lines/min assembly. *Conditional Assembly. *Plain English error messages. *Full Expression evaluation. *Unrestricted able names. *Directives include: ORG, BYTR, WORD, TEXT, RMEM, LET, IF, GET, PUT, LIMIT, CODE, NOCODE, READ. Commands include: LIST, VOLIST, LISTP, TITLE, PAGE, PLEN, WIDTH, DUMP.

*Menu-driven Screen Editor includes move copy and delete blocs, tabs, search and replace, print all/part of text, Load/Save all/part of text. Disc/ROM version only. Register display, Memory Edit commands, breakpoint, string search in RAM, link to AMSDOS.

Cheques/Postal Orders to:
Arnor Limited, PO Box 619, London SE25 6JL.
Technical Enquiries: 01-852 2174

Arnor LTD

592

AMSTRAD CPC 464
UTILITY PROGRAMS FROM PRIDE

Always the first and the best software. Offering more features and better value for money than other similar programs available. We also offer a fast reliable and friendly mail-order service. No enquiry is ignored.

SYCLONE Copy and/or convert your programs to load in up to four times faster.
Features include:
★ Commands available from Basic.
★ Choice of four loading speeds, 1000 to 4000 baud.
★ Copies all tested software.
★ Comprehensive header reader.
★ Load and list protected basic programs.
List your "Welcome" tape. Cassette £6.95 inc. P&P.

NEW *** NEW *** NEW *** NEW *** NEW *** NEW *** NEW *** NEW

TRANSMAT Transfer your programs onto the Amstrad Disc System.
Features include:
★ Faithfully transfer all programs.
★ Adc relocator is necessary.
★ Auto or non auto modes.
★ Erase or rename programs.
★ Comprehensive header reader.
Cassette £7.95 inc. P&P.

ZEDIS A comprehensive machine code editor and disassembler
Features include:
★ Continual menu display.
★ Break point insertion.
★ Register inspection.
★ High speed hex code/string search.
★ Hex code/string input.
Instructions included to disassemble ROMs.
Cassette £6.95 inc. P&P.

PRINTER PAC 1 A printer enhancement program for the DMP and Epson compatible printers.
Features include:
★ Screen dumps in all modes.
★ Two sizes of dump for Epson compatible printers.
★ Text dump in all modes.
★ Three new type styles for the DMP1.
★ Abbreviated codes to printer.
Cassette £4.95 inc. P&P.

SPECIAL OFFER Worth £3.95
Buy more than one title and get a cassette containing a real time digital alarm clock FREE including its P&P (while stocks last).
Europe — add £1.00 per title, rest of world — add £1.50 per title.

PRIDE UTILITIES (YC)
7 CHALTON HEIGHTS, CHALTON, LUTON, BEDS LU4 9UF 591

NEW — Commodore 64 —
TURBO-BREAKER

At last, Transfer Turbo games to Disk. Blank screen, Flashing and picture screen turbos by most software houses. Easy to use..... £10.95
******** TURBO-SAVER ********
Make easy Turbo back up copies of your slow load games, no user knowledge needed, easy to use... £8.00
******** TRANSFER — MK2 ********
Transfer most slow load games to Disk. Simple to use, and needs no user knowledge, or skill..... £8.00
******** DISK-TUR30 ********
Make your disk games load faster, 45secs instead of 2mins, does no harm to your drive..... £8.00
******** DISKOPY ********
A Selective disk copier, fast and very easy to use..... £7.00
******** DISK DOCTOR ********
A Disk editor, alter any part of the disk, recover a scratched file..... £8.00

ARROW MICRO SERVICES
20 Portmeadow Walk
London SE2

590

STOP—REVEAL

A unique cassette for the 48K Spectrum. Genuinely lets you:
1. STOP virtually all programs, BASIC, MACHINE CODE and even HEADERLESS FILES, protected or not.
2. REVEALs the hidden Basic in Machine Code programs. (Could be clues in adventure games).
3. LISTS actual Machine-Code on your video.
Now you can STOP, LIST, MODIFY, STUDY most Spectrum programs at your leisure. (And cassette is Microdrive compatible).
Includes a DISSASSEMBLER so can even study Sinclair ROM, etc, plus the most Advanced HEADER-READER ever written, plus pages of SECRETS OF THE TRADE explaining professional methods used to hide lines/programs, etc.
YOU CANNOT GET A MORE POWERFUL CASSETTE
(Even STOPS/REVEALS programs which are a genuine 48K long).
POST £5.95 FREE
(Europe add £1. Other areas add £2)
KERR, 1-2 HIGH STREET,
KING'S LYNN, PE30 1BX. 332

SUPERIOR SPECTRUM TAPE COPIER

The **NEW 007 SPY** is the **ONLY** copier capable of copying even a full 48K Headerless program.

* Copies multipart programs all in one loading, automatically.
* Copies programs from 1 to 65279 bytes long. (Can yours?)
* Copies Headerless files up to a full 48K (No other copier can).
* Copies **ALL** types, Basic, Code, Screen Arrays, Headerless.
* Guaranteed easiest to use.

007 SPY IS JUST £3.95
(Europe + 50p Other areas + £1.50)
(Please order as 007N) 391

ZX-GUARANTEED (Dept YC)
29 Chadderton Drive, Unsworth,
Bury, Lancs. BL9 8NL.
Tel: 061-366 5712

SPECIAL AGENT
DE-LUXE SPECTRUM COPIER

A multi-purpose yet extremely easy to use tape copier. Ideal for the experienced or absolute beginner.

**** 5 STAR RATINGS ****

1. Copies multipart programs all in one loading.
2. Copies Basic, M/Code and even the Headerless programs upto 51K.
3. Cannot be fooled by weird names or false Headers. (Other copiers would crash).
4. Can remove Autostart from Basic.
5. You can determine Pauses between sections if desired.

Once you've experienced this super DE-LUXE silk smooth copier, you'll never want to use any other.

£5.95

O/seas, Europe +50p
Others +£1.50
(Order as SPECIAL AGENT)

KERR, 24/25 High Street
King's Lynn, Norfolk, PE30 1BP

511

ATMOS aide memoire/copier, assembler and disassembler/monitor. 3 utilities £5 each. S.S.S., 84 Braidwood Road, London SE6 1OX. 587

COMMODORE 64 backup interface. Make reliable backup copies of turbo loaders, machine code etc., from datasette to any hi-fi cassette recorder. Special introduction offer £7.95. McQuade, 55 Shahshiry Drive, Heywood, OL10 2PH. 588

SCRIPTURE memory quiz learn bible as you play Vic 20 +16K. CH/PO £1.50. John Pates, 24 Wichnor Close, Clifton Grove, Nottingham. 589

ATARI 400/600/800/XL

Cartridge Backup System
Backup 8/16K cartridge to tape and disc. 400/800 with 48K ram. De luxe version has gold edge blades on cartridge simulator.
Cartridge to tape & disc..... £15.00
de luxe £20.00
Spare simulator board..... £12.00
de luxe £17.00

XL Cartridge Backup
600 XL £25.00
800 XL £30.00
Specify Tape or Disk

Tape Duplicator
Duplicate almost any single or multistage tape. BASIC program, 48K ram recommended.
Tape Duplicator..... £6.00

Fast Loader
Reduce tape loading time of almost all of your single multistage tapes by up to 49%
Fast Loader..... £6.00

600 XL Memory Upgrade
Upgrade your 16K to 64K. Complete kit with full instructions.
Memory Upgrade..... £75.00

Services
Listing and prom blowing services also available. Send for details.

Send large SAE for further details on any/all of the above and new products. All prices are inclusive of p&p. Utilities are for 400/600/XL/800XL unless otherwise specified.

S. Terrell
17 Cook Close Road, Yaxley,
Peterborough PE7 3HJ 419

Spectrum Repairs

£16.95 inclusive of labour, parts, p&p etc. ZX81 for £11. Fast reliable service. (Av. repair 24 hrs) by qualified engineers. Send computer only to:
HSCOMPUTER SERVICES
2 The Orchard, Warton, Preston, Lancs.
PR4 1BE. Tel. (772 632686 or 634897

327

• NOW AVAILABLE FOR THE AMSTRAD CPC 464!!!

WIN THE POOLS?

SPECTADRAW I — THE LATEST VERSION OF THE ORIGINAL AND BEST POOLS PREDICTION PROGRAM FOR THE 48K ZX SPECTRUM!!!

AND NOW ... AMSTRA-DRAW — THE FIRST POOLS PREDICTION PROGRAM FOR THE AMAZING NEW AMSTRAD CPC 464!!!

- Supplied with Database containing data on over 10,000 matches since 1980.
- You update the Database each week — but no tedious typing, just land division names already in program!
- Errors easily corrected — the program even checks your entries!
- Comprehensive instruction manual and menu driven program — easy to use even for a newcomer to computing!
- Will increase the odds likely draws for those who prefer a bet on fixed odds.
- Built in perm generator — complete your coupon direct from the screen!
- Full microdrive compatible (Spectadraw only).
- Compatible with Curran Microspeech — the first pools programs that you can predict aloud! (Spectadraw only).

Spectadraw I for the 48K Spectrum ..... £9.95 inclusive
Amstra-Draw for the Amstrad CPC 464 ..... £9.95 inclusive
(Cheques/PO's payable to B. T. McALLEY)

We match every Monday with the database made up to include all matches up to the date of dispatch.

SPECTADRAW (Dept CO), Cowlaze, Chinnor, Oxford OX94TD.
(Tel: 0844-52426) 530

SINCLAIR QL
Only £379.99
QL COLOUR MONITOR
Only £255.95
COMMODORE SX-64
PORTABLE
(Disk Drive & Col. Monitor Built in) only £795.95
PHILIPS 12" Green Monitor (Composite video & Sound) £85.95
SINCLAIR FLAT SCREEN TV £99.95
All prices include VAT & Fast Free Delivery (UK only)
Please send cheques/PC's to: COMPUTER PLUS
45 Bridge Street, Newcastle. Staffs. ST5 1RT.
Tel. 0782 622333
580

AMSTRAD CPC 464
AMSCOPY II

New improved version of the best-selling "AMSCOPY" backup copier. Now copies all blocks in one go with a choice of four. (yes, four!) save speeds. Deprotection available if required. 100 machine code, will copy all file types. Instructions on transfer from tape to disc included. Still with header reader — all this for £4.95 fully inclusive.

ULTRATEC (COMPUTING)
Floor 28, 93 Mount Road,
High Barnes, Sunderland.
Tel. (0783) 281550
Trade and Overseas orders welcome
(overseas please add £1.50
(Owners of the original "AMSCOPY" — Send us the original tape plus £1.50 and we'll put AMSCOPY II on the B-side and send it by return).

AMSTRAD
TAPE COPIER
CHOICE OF SAVE SPEEDS
PRODUCES UNPROTECTED COPIES OF ALL PROGRAMS TESTED
ONLY £7.50
REDBEAD COMPUTERS
45 REGENT PLACE, BIRMINGHAM 1.
577

DISKount PRICES

5¼" SS/DD Diskettes	£1.50
3½" SS/SD Diskettes	£4.50
2000 Sheets (11"x3½") Listing Paper (11"x9")	£16.00

CASSETTES: C15 50p
C20 60p C30 70p
(Case/Labels Inclusive)
* 1 Year Guarantee
* p&p free: Delivery 7 days
* Further discounts available
* We supply schools & colleges

Cheques/P.O.'s to:
C & S Computer Services
144 Sutcliffe Avenue, Grimsby
Sth. Humbs. DN33 1AP.
587

ROYALTIES paid on original programs accepted for distribution. Everything considered. Genuine offer. Phone 0246 73503 or send to: Grayson, "Freepost" Chesterfield S40 3BR.
582

ORIC
ADVANCED USER GUIDE

For the Oric-1/Atmos, this book gives a complete description of the operation of these computers, plus a complete ROM disassembly and circuit diagram.
287 PP. ISBN 0 947929 01 0
Available from bookshops or by mail at £10.45 (inc. p&p) from:
ADDER PUBLISHING LTD., PO BOX 148, CAMBRIDGE CB1 2EQ.
578

ZX81 machine-code leaflet. Introduces m/c to beginners. SAE: Nick Godwin, 4 Hurdur Crescent, Eyemouth, Berwick, TD14 5AP. Tel: Eyemouth 50965.
583

DUST COVERS FOR AMSTRAD CPC 464 £6.95

* Matching proofed nylon, treated with anti-static inhibitor.
* Piped in green with AMSTRAD CPC464 on keyboard.
* State single or two-piece, colour or mono.

COVERS FOR OTHER COMPUTERS
BBC, DRAGON, COMMODORE, in bage, piped in red or brown, COLD STAR, SANYO, SONY, and TOSHIBA in back piped in grey £3.50. SPECTRUM PLUS and QL in black £2.50 each with name on keyboard.

MATCHING COVERS FOR PRINTERS
AMSTRAD DMP 1, CANON PW 1000A, COMMODORE MPS 801, EPSON FX80/RX80, MANNESMAN MT80, PANTHER DX109, TAXAN KP810, BROTHER HR6, All at £3.50. JUKI 6100 at £4.50.

48 hr. turn round, first class postage.
BBD Computer Dust Covers
39 Marse Avenue,
Wrightington WN6 9RP.
Tel. 0257 422968

BOARDROOM. Spectrum ZX81 16K Dragon 32. Superbly realistic game of business intrigue and skill. £7.95 each. M. Lovell, 40 Mentmore Crescent, Dunstable, Beds, LU6 3NN.
581

ATARI
400/600/800/800XL
Tape to Disk Utility.
Transfer single AND multi-stage "boot" tapes to disk and then run them from a fast, autoload menu. The only one that can handle up to five stages. £12.95 inc.
Tape Copier
Easily duplicate single and multi-stage, M/C, BASIC, even non-standard format tapes. Option to save copies at faster baud rates. £6.95 inc
Cheques/PO to C. Gibbons, 170 Bradwell Common Boulevard, Milton Keynes, Bucks MK13 8BG.
594

ASTROLOGY for beginners only £11.50

A Starter Pack comprising a simple program to calculate a horoscope, an introductory booklet & 2 self-teaching programs (how to interpret the horoscope).

No previous knowledge required

48K Spectrum, 3BC/Electron 48K Oric, Dragon, Tandy Color, Tandy TRS80, Commodore 64/PET, Atari, Amstrad, Sharp MX80A/K/700, Colour Genie, Video Genie/System 80/PMC80
many more programs for experienced astrologers
also other micros

Dez programmas zijn thans in Nederlandstalige versies verkrijgbaar voor Spectrum. Vraag Documentatie! Cash with order (add 50p outs de UK) or large sae for the free catalogue to:

ASTROCALC (Dept YC)
67 Peascroft Road
Hemel Hempstead,
Herts HP3 8ER
Tel: 0442 51809
537

MULTIPLY your income/profits NOW with the breakthrough ENTREPRENEUR ASSOCIATION. Discover new, lasting success. Act today! and send for full, free details ENTREPRENEUR ASSOCIATION, Dept A4, 5 Cork Street, Mayfair, London W1.
473

DRAGON Mediarale Spread Sheet 756 cells +-/*%. Average total R&Col's. All functions supported with menu and instructions. Only £9.95. Media Magnetics, Freepost, West Bromwich B70 6BR.
596

POWERFUL UTILITIES

AMSTRAD SPEEDMASTER FAST LOAD UTILITY
SPEEDMASTER is a tape copier with a **difference.** It allows you to save the copy **in a choice of three speeds** normal, fast or very fast. Also incorporates a **header reader** and **deprotect basic** option. Continuous load and save. Tests have proved **104% successful.** An **invaluable** piece of software.
ONLY £7.95
Tape to disc utility due shortly.

TAPE COPIERS
Unique machine code programs to allow security back-up copies of the majority of protected software.
Available for:

Commodore 64 (normal speed load only)	£5.95
VIC 20 (All memory sizes)	£5.95
Spectrum	£5.95
Electron	£5.95
Atari (All models)	£5.95
BBC (Model B cassette files)	£5.95

All with full instructions

TAPE TO DISC UTILITIES
BBC
A **very useful** utility to help shift those stubborn tape programs onto **your own discs** **ONLY £9.95**
ATARI
A dual purpose program that allows single stage boot programs to be shifted onto disc. Includes output to tape. Works on **all models**
ONLY £9.95

COMMODORE 64
THE BEST RANGE OF UTILITIES FOR THE 64. WRITTEN BY PROFESSIONALS—SOLD BY PROFESSIONALS

DISC DISECTOR V2.0
At last a really powerful disc copier and utility program. Incorporates a range of powerful programs. Includes **"Fastcopy"** Takes just **4 minutes** to read and write a **whole disc** **"Error Copy"** automatically reads and writes **all** error types, now you can make a security back up of those expensive business programs. **"Quickdisc"** more than **halves** disc loading time, **very useful. "File Copier"** allows **selective** copying from directory. **"Track and Sector"** a slower but very thorough program. Also includes the following useful utilities. **Viewbam, Fast Format, Unscratch, Disc Monitor, Menu Maker, Index, Retitle, Rename, Scratcher, Disc to Tape** and **Tidy.** If you have a 1541 you **must** have Disc Disector. Supplied on disc with full instructions.
ONLY £29.95

QUICKDISC
Incorporating Menu Maker
NOW EVEN FASTER
Speed up your 1541 disc drive with this **new** program. Loads most programs at **4 times** normal speed. A flexible package that allows you to incorporate a **menu and fast loading** on **your own discs.** Also includes a file exchanger (a programme put on disc with **"Disco"** (THE tape to disc utility) another way of making fast load disc programs. A **must** for all disc drive users.
ONLY £11.95

FASTBACK
Fast Load Utility
Convert your slow loading software to **high speed load** with Fastback. The **most sophisticated** program of its type allow you to produce **"turbo"** loading versions of most single and **multipart** software that load **independently** of Fastback. **Simple** to use **no programming skill needed** example (Load the Hobbit or Manic Miner) in **150 secs.** Tried and trusted (over 2000 sold).
A very professional program.
ONLY £9.95

DISCO
THE TAPE TO DISC UTILITY
We **guarantee** that this is the **best** tape to disc utility on the market.
Very easy to use no programming knowledge needed. Automatically handles device numbers and multi part programs. Programs **auto load and run** once transferred and can also be made to **fastload** with **Quickdisc.** Handy for making your own disc programs autorun.
ONLY £9.95

DOUBLER
Tape Back Up Device
Includes **hardware and software.** This **amazing** new cassette port adaptor allows you to make back up copies of **"turbo" software.** Tests have proved **100% successful.** Requires access to two cassette decks. The special software generates a **brand new machine copy** on a one tape, single loading from the other. **Fast and reliable,** they said it couldn't be done.
ONLY £12.95

SPECTRUM
Yes, after spectacular success on the 64 Doubler is now available for the **Spectrum.** Tests have proved **100% successful.**
ONLY £12.95
PATENT APPLIED FOR

ROCKET
Fed up waiting for programs to load one size? Rocket is a utility for the programmer, speeds up loading and saving by about **8 times** while still allowing for normal speed operations. **Does not** affect the speed of BASIC as no wedge is used. Programs can also be saved with high speed system to **reload independantly.** A must for serious programmers who have no disc drive.
ONLY £7.95

BIGMOUTH
The **superb** new **speech synthesis** program for the 64. Uses "speak" as a basic command. **Very easy to use.** Can be incorporated into your basic programs. Words are entered in phonetic English, ie. spelt as they sound. Therefore vocabulary is **unlimited. Great fun** and good for educational purposes.
ONLY £7.95

COMMODORE CONNEXION
Connect any Centronics type printer to your 64. Price includes lead and software on cassette **with** operating instructions booklet.
Simple to use and very reasonably priced
ONLY £11.95

3M SCOTCH DISCS
Lifetime guarantee: Box of Ten
SSDD **£16.00** DSDD **£23.00**

DATA RECORDER
A dedicated data recorder designed to use on the CBM 64 or VIC 20. Specification is identical to the **with pause button.** Model available for the ZX81 (16K) at the same price.
SATISFACTION GUARANTEED
ONLY £24.95

All prices include P&P and VAT. Send cheque Postal Order or Credit Card No. Credit Cards orders accepted by phone. Callers welcome. Wide range of goods stocked. Trade enquiries welcome. Europe: orders send price as advertised. Outside Europe £2.00 for airmail. Mail order to Evesham Shop please.

MICRO CENTRE
BRIDGE STREET, EVESHAM, WORCESTERSHIRE
Tel: 03864 9641

MICRO CENTRE
1756 PERSHORE ROAD, COTTERIDGE, BIRMINGHAM.
Tel: 021-458 4564

586

COMPUTER ASSISTED LEARNING
INFO-STREAM offers over 200 QUALITY EDUCATIONAL CASSETTES and DISKS for the Spectrum, BBC, Electron & CBM64, with SPECIAL OFFERS for the VIC-20 & ZX81.
Our new range covers VIDEO CASSETTES and BOOKS on BASIC, Assembly Language and Advanced Programming, together with introductions to Forth, Lisp, Logo & Pascal.
Send 22p SAE for FREE INFORMATION PACK to: INFO-STREAM (Dept YC06), 36A Chase Green Avenue, Enfield, Middlesex, EN2 6EB. Export enquiries welcome.
496

ORIGINAL programs urgently needed Oric and Commodore 64. Educational or Games. Cash payment or royalties. Professional ethics strictly adhered too. Send your program for consideration. Knight Products (UK) Ltd., 71 Colne Road, Earby, Lancashire BB8 6XL.
257

SPECTRUM KOPYKAT

Simply the best Copying any 16/48K Spectrum program is as easy as LOADing & SAVEing your own programs. Even unstoppable programs can now be backed-up onto a fresh tape. Only £4.95.
IT CAN EVEN COPY ITSELF

NEW
MICRODRIVE KOPYKAT

Transfer your cassette based software onto the ZX Microdrive RELOCATES programs, Stops & reveals programs ESSENTIAL for M/D transfer. Only £4.95.
Both with FREE Header Reader
Despatched by Return of Post.

MEDSOFT
PO Box 84, Basingstoke, Hants
141/141

UNDERWULDE to Microdrive. Send 2 £1 notes to: Eirik Eng ILAV5 0966 Oslo9 Norway for listing. Instant delivery on receipt.
590

COMBINED introductory programming course and recreational holiday in beautiful Snowdonia. Blue Chip Computer Holidays, Bron-y-Foel, Dinorwig, Gwynedd LL55 3EH. Tel: 0286870405.
595

MAGIC-MESSAGE

Put YOUR name in the HALL OF FAME, be the HERO of the game. Find the hidden list of words in Adventure games. All this is possible with MAGIC MESSAGE which lets you look at and change messages in machine-code games. Simple load MAGIC MESSAGE, play in main part of game and like Magic messages will appear on your video.

Post £4.95 Free
O/seas, Europe +50p Others +£1.50 (Please order as Magic M)
551

ZX-GUARANTEED (YC)
29 Chadderton Drive, Unsworth, Bury, Lancs, BL9 8NL

The Publishers take all reasonable care to ensure that classified advertisements are genuine, but readers must satisfy themselves that they will be obtaining what they require before entering into transactions, particularly if they involve large sums of money.
128/128

BLANK CASSETTES

Rely on the professionals for guaranteed top quality computer/audio cassettes at great value budget prices. Packed in boxes of 10, complete with labels, play cards and library case.

Prices include VAT, post & packing

Length	Box Price (10)	Qty.	Value
5 mins (c.5)	£4.35		
10 mins (c.10)	£4.40		
12 mins (c.12)	£4.45		
15 mins (c.15)	£4.50		
30 mins (c.30)	£4.70		
60 mins (c.60)	£5.30		
90 mins (c.90)	£7.00		
		£	

Cheque/Postal Order enclosed for

TRADE ENQUIRIES WELCOME. GET BEST TERMS, SERVICE & PRODUCT, BUY DIRECT FROM MANUFACTURERS OF PROFESSIONAL BRAND CASSETTES.

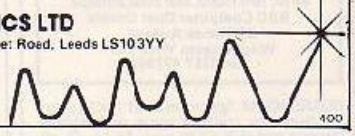
NAME .....

ADDRESS .....

.....

PROFESSIONAL MAGNETICS LTD
(Dept. CCO), Cassette House, 329 Hunslet Road, Leeds LS10 3YY
FREEPOST Tel: (0532) 706066

400



585

EDUCATION

Whether it be SPECTRUM, ZX81 or BBC B, we hold in stock probably the largest range of educational software available, currently in excess of 50 DIFFERENT EDUCATIONAL CASSETTES produced by the major software houses.

SAE for catalogue and SPECIAL OFFERS. Also GAMES TAPES: 3 for price of 2.
LOCATOR, 12, Fernhall Drive, Redbridge, Essex, IG4 5BN. Tel. 01-550 5575 340

COMMODORE 64 — AMSTRAD — MSX OWNERS

MIDLAND COMPUTER LIBRARY

1. All the latest titles on cassette, disc and cartridge.
2. Hire your first two games absolutely free.
3. Life membership £6.00.
4. Hire charge from only £1 inc. p&p for full 7 days.
5. No limit to the amount of games you can hire.
6. All games originals with full documentation.
7. Games, Business and Educational software.
8. Return of post service guaranteed.
9. Lowest new hard and software prices in the UK.
10. Join now on money back guarantee.
11. Over 1,000 games in stock inc. many US imports.

Send cheque or postal order for £6 with your two selections or large SAE for further details to:

MIDLAND COMPUTER LIBRARY
The first and largest Commodore 64 library in the world
31 Evenlode Close, Lodge Park
Redditch B98 7NA. Telephone 0527 23584 444

VISA

* BACK-UP SYSTEM FOR * *C3M-64 & VIC-20*

The BACK-UP BOARD is the latest, fastest, and most unique way to back-up your tape programs. With this board you can connect a second CBM tape deck to your computer. You can copy a program on the second deck while it loads from the first. You can back-up m/code, turbo loaders data files etc. This system will back-up programs that your tape based copier has failed to do.

BACK-UP BOARD for
CBM-64 & VIC-20
TRIGSOFT (Halifax)
46 Ripon Street, Parkinson Lane,
Halifax, West Yorkshire HX1 3UG 493

BASIC PROGRAMMING COURSES

Computer for Christmas? Learn BASIC programming the most effective way with our home study or correspondence courses. Programming CAN NOT be learnt from User Manuals alone. Our course, for the complete beginner upwards (especially parents) also covers ALL aspects of home computing, including self test sections and final exam. For BBC, CBM64 and Spectrum. Home study course £19.95, correspondence course (incl. certificate when passed) £49.95.

RIDLEY, Dept. YC,
WALLSEND HOUSE,
PEVENSEY BAY, SUSSEX. 584

! 1985 VERSION!

Would you like to transfer your Spectrum programs from

① **MICRODRIVE TO MICRODRIVE** ③ **TAPE TO TAPE**
② **TAPE TO MICRODRIVE** ④ **MICRODRIVE TO TAPE**

Then do it with

TRANS-EXPRESS

TAPE TO MICRODRIVE

MICRODRIVE TO TAPE

TRANS-EXPRESS is the most comprehensive package of four m/c utilities for transferring Spectrum programs. They are user-friendly, simple to use, reliable & very efficient.

They will enable you to transfer any kind of programs up to the full 48.0K length. TAPE TO M/DRIVE will also automatically, if necessary, modify, restructure and relocate both BASIC and M/C to run from m'drives.

You can buy any of the 4 programs for £5.50 or TAPE TO M/DRIVE AND M/DRIVE TO M/DRIVE together for £7.50, or all the 4 programs on a tape for £9.95 or on a m'drive cartridge for £14.95.

MICRODRIVE TO MICRODRIVE

NEW! . . . AMSTRAD version of **TAPE TO TAPE** at £5.95 only **NEW!**
Transfers programs of any length, any speed, headerless, with unorthodox loaders, etc. Continuous LOAD/SAVE, repeated SAVE, full abort., full header, reader, unprotect, etc.

Please send me a copy of **TRANS-EXPRESS** ①②③④ Please tick where applicable. I enclose cheque/PO for ..... Please add £1.00 for orders outside UK YC

Name .....

Address .....

ROMANTIC ROBOT 77 Dyne Rd, London NW6 7DS 108/109

TECTEL ROBOTICS

CONTROL BOARDS FOR HOME COMPUTERS

ORIC
ORIC DUUBRY £24
1 of 16 channel controller
ORIC ADC £34
Superfast 8 channel analog — digital scanner, 8 bit resolution.
ORIC I/O port £33
16 programmable channels
ORIC PRINTER £95
26 col, matrix, graphics double sized print, ink & ribbons.

ZX81
ZX81 DUUBRY £22.50
1 of 16 channel controller
ZX81 ADC £34
Superfast 6 channel analog — digital scanner, 8 bit resolution.
ZX81 I/O port £34
16 programmable channels
ZX81 HI-RESOLUTION GRAPHICS £28
stunning results.

ITEXT SOFTWARE a new range of educational programs.

TODDLERS (pre school)
LEARN your ALPHABET
LEARN to COUNT
LEARN your COLOURS
LEARN your SHAPES
ABOUT the HOUSE
ABOUT the KITCHEN
ABOUT CLOTHES
£3.95 each

MUMS & DADS
ITEXT cookbook (English)
ITEXT cookbook (Chinese)
ITEXT cookbook (Italian)
ITEXT cookbook (Indian)
ITEXT Wine & Beer Making
ITEXT Cookbook Desserts
ITEXT Cookbook Confection
£5.65 each

Send cheque or Postal Order to:

TECTEL
Telford Opportunities Centre, Halesfield 14,
Telford, Shropshire.
Tel. 0952-581738

P&P £1.50 for control boards £1 for tapes 651/12

RETAILERS

For fast speedy distribution service contact Drake Distribution on 0752 500951/2

We can offer you:
- 24-hour delivery in UK
- The Best Discounts
- Starter packs available
- All the latest software
- Personal weekly delivery service throughout the UK
- Export enquiries welcome
- 48-Hour delivery can be arranged

As retailers ourselves we know the titles that sell — Phone or write for a price list now.

DRAKE DISTRIBUTION
Unit 45, Enterprise Plymouth,
Somerset Place, Plymouth PL3 4BB

1241

COMMODORE

SUPER BREAKER BACK-UP BOARD

For the Commodore 64 and Vic-20

When a second CBM type cassette unit is connected to the board it will make back-up copies of cassette based software including turbo/fast loaders, Basic and/or machine code and data files. Priced at £9.50 plus 50p p&p UK (Europe add £1.00, elsewhere add £2.00). An optional RESET SWITCH can also be fitted for only £2.00 extra inclusive. Send cheque/PO or stamp for full details to:

C. KENT, 15 Bamburg Close
Danesholme, Corby, Northants NN18 9PA

549

COMMODORE

NEW!!

TAPE COPIER 6

Make your essential BACK-UP copies with our second generation copier package TC3. Manages virtually all programs. 48K SPECTRUM only.
* Deals with fast leaders + converts them to normal speed for drive transfer.
* LOADS in program parts CONTINUOUSLY — even when there is no sound gap, short tone leaders, false/illegal headers, etc, making the process simple and effective. User friendly.
* Copes with v. long programs (say 65000 + bytes).
* Extra features. e.g. integral header reader, pause, delete, abort, repeat copies, FULL manual.
* MINITAPE 6 (MT6 — extra program transfers Basic, Code + arrays directly to m/drive + other features.

TC6 costs £5. (£6 with MT6 on same tape). MT6 £3 on separate tape (old customers old tape + SAE but £2 reduction on above prices).

MICRO/WAFA/DISC DRIVE TRANSFER

48K Spectrum owners with Micro/Wafa/Disc drives can NOW transfer the MAJORITY of their programs (inc headerless, long programs, + those with LOW addresses — say 6384).
To transfer from tape you must convert the program, and then transfer the converted bytes. MD1 (or WD1) has 5 programs *giving you the tools* to do the modifications to get them running. MD1 also has two "CAT" housekeeping programs. MD1/WD1 has a comprehensive manual with example transfers and exercises.
This widely acclaimed program (see Your Spect. No. 9 P141) is ESSENTIAL if you are going to transfer MOST of your programs to your drive. MD1 (WD1 for disc or Wafadrive owners) costs a mere £6.50.

ALL PRODUCTS CARRY OUR MONEY BACK GUARANTEE
OVERSEAS: add £1 Europe, £2 other for each product.
SAE for enquiries.

365

LERM, DEPT YC, 10 BRUNSWICK GDNS, CORBY, NORTHANTS

MICRODRIVE BACK-UP
"THE PRINCE"

Transfers all ultimate games including "Underworlde" and "Knight Lore". Transfers "Decathlon", "Cyclone", "Ghostbusters", "Lords of Midnight", "Monty-Mole", "Codename Mat", "Trashman", "Pyjamarama", "Scrabble", "Chequered Flag", most imagine games and many more. Absolutely guaranteed to work! Incredible value at £6.95.
Cheques to: M. Alexander, Alexander Computing Systems, 67 Lansdowns Lane Charlton, London SE7.

Alexander Computing Systems 1985

593

A	
Addictive Games	87
Amstrad	74, 75
Anirog	IBC
Anthony Ashpatel	135
Argus Press Software	38
B	
Barclaycard	10, 11
Beebug	34
Betasoft	135
Bugbyte	IFC
C	
Canon Film Distributors	70
Cumana	132, 133
D	
DACC	84
DK Tronics	88, 89
Dennison	135, 137, 139
E	
Elite Systems	4, 5
F	
Friel Ltd	28
G	
Games Workshop	62, 63
Gilsoft	117
H	
Hisoft	146
I	
Ibico	30
Incentive Software	43
Industrial Process	34
Innelec	64
Interface	58
K	
Kobrahsoft	116
Kuma	49
L	
I.C.I.	28
Llamasoft	95
M	
Macmillan Software	113
Metacomco	109
Microprice	120
Micro-X	22
Microanswers	116
Microgold	28
Micronet 800	18, 19
Mikrogen	54
Miles Better Software	22
N	
National Software Library	56
National Westminster Bank	69
New Generation Software	70
O	
Oasis Software	78
Ocean Games	BC
Ocean Software	8, 9
P	
Philips & Philips	26
Picturesque	30
Pitman Books	40
Protek	138
Q	
Quicksilva	12
R	
RSD Connections	137
S	
SMT	101
Saga Systems	136
Selec Software	30
Shard Software	30
Sinclair Research	6, 7, 13-17, 96
Software Communications	73
Software Library	34
Swanley	70
Swescot	22
T	
Tasman	118
The Microworkshop	137
Thoughts & Crosses	32
Toshiba	61
U	
US Gold	30, 44, 50, 56, 76, 105, 131, 134, 140
V	
Visionstore	24
W	
William Stuart	56
Wizard Software	56

SELL IT WITH YOUR COMPUTER

CLASSIFIED ORDER FORM

Classified Rates

Linage: 50p per word (Min 20 words) — prepayable

Linage advertisers should complete the form provided in BLOCK CAPITALS. Phone number counts as 2 words. Name and address to be paid for if used in advertisement. Box Number if required is £4.00 extra.

Display — rates per scc (Min 2scc)

One insertion	:	£9.00
Three insertions	:	£8.70
Six insertions	:	£8.50
Twelve insertions	:	£8.00

Display advertisers should provide separate copy and preferably reserve space by phone (01-661 3036).

Method of Payment

Cheques etc, should be made payable to Business Press International Ltd, and crossed. I enclose herewith cheque/PO for

£.....

Please debit my Access/Visa Barclay Card/American Express/Diners Club Int/ (as below

SIGNATURE

Post to:

Cut out the order form and return together with your remittance to: Classified Department, Your Computer, Room H211, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. (01) 661 3036

Please insert the following advertisement in Your Computer Classified Section

					LINAGE
					£10.00
					£12.50
					£15.00
					£17.50
					£20.00
					£22.50
					£25.00

No. of insertions required ☐ Box No. required YES/NO

NAME *(Please include initials)*.....

ADDRESS.....

.....

.....

Payment by credit card please state address card is registered

Daytime tel. no .....

THIS FORM SHOULD BE RETURNED BY FEB 27th FOR APRIL ISSUE PUBLICATION

Company Registered Number. 151537 (England) Registered Office: Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

DATEBASE

Hot lines

Acorn Computers
Telephone: Cambridge 0223 210111

Atari
Telephone: Slough 0753 24561

Amstrad
Telephone: Brentwood 0277 228888

Commodore CBM
Telephone: Northampton 0536 203252

Enterprise
Telephone: 01-739 4282

Oric
Telephone: Cambridge 02205 5141

Sinclair
Telephone: Cambridge 0276 68531 1

Tandy Corporation
Telephone: Birmingham 021 5566101 ext 33

Toshiba
Telephone: Camberley 0276 62222

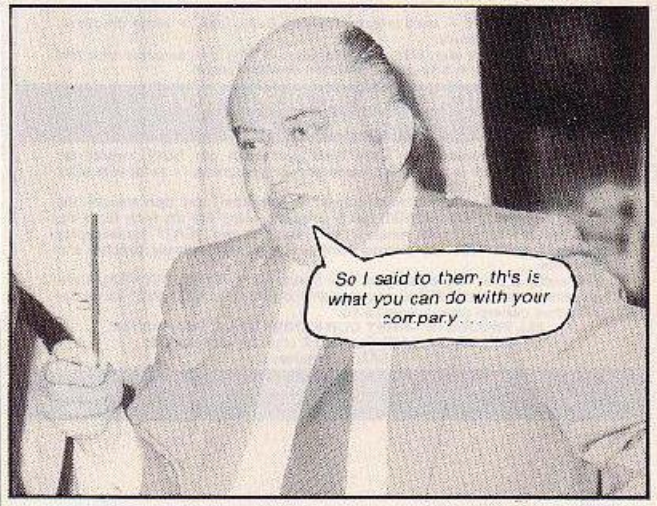
Local, national and international micro events are updated here. To publicise your event, phone Paul Bond on 01-661 3472.

Scottish Computer Show and Conference

Takes place March 12-14 at the Anderston Centre The Albany Hotel and the Holiday Inn, Glasgow. Trade Show, covering the big boys as well as home micros. Tickets are readily available from Cahners Exhibitions Ltd. Telephone 061-832 4242.

Computer courses

Hilton International Computer Training Ltd are arranging courses aimed to provide an introduction to computing for families. Cost is about £11.50 per person, and content includes components of a micro, buying one and the future of computing. To be held on 17 and 31 March, and 14 April at Clarendon Hotel, Blackheath. Telephone 01-852 2549.



Jack Tramiel makes a few pointed remarks about his former company, Commodore, whilst simultaneously indicating the direction he expects Atari profits to take now that he is in charge.

INFO

INFO takes place from March 26-28 at Olympia London. Open to the public. Some micros but mostly big stuff. Telephone BED Exhibitions, Wallington, Surrey 01 647 1001 for more details.

HISOFT

ULTRAKIT £9·45

The most powerful toolkit yet for ZX BASIC. All the features you will ever need, AUTO insert, full RENUMBER, block DELETE, CLOCK, ALARM, error trapping, break trapping. Full TRACE with single-step and much, much more. Makes ZX BASIC easy-to-use and powerful.

DEVPAC £14

An excellent assembler, an advanced line-editor, a comprehensive disassembler and a superb 'front panel' debugger all in one package. Used by many leading software houses to write their games. "Buy it!" Adam Denning 1984.

PASCAL £25

A powerful and almost full implementation of Pascal - not a Tiny Pascal. A valuable educational and development tool, programs typically run 40 times faster than a BASIC equivalent. Spectrum version includes Turtle Graphics package. "I haven't seen any other compiler that could match Hisoft's Pascal"

HISOFT
180 High Street North
Dunstable, Beds. LU6 1AT
Tel: (0582) 696421

HISOFT

C

for the ZXSpectrum

Hisoft is pleased to announce a new compiler for this popular and effective systems programming language. Not a tiny-C but an extensive, easy-to-use implementation of the language. Allows direct execution of compiled statements. Supplied with function library. Available direct from Hisoft for £25, or write for further details.

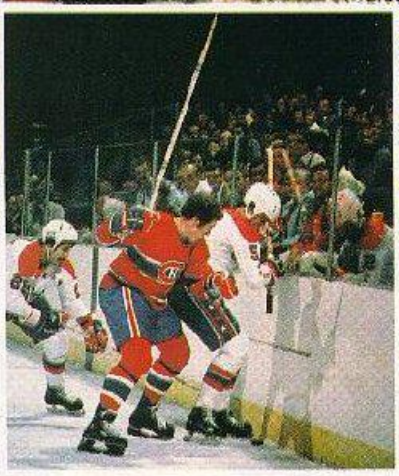
All prices, UK delivered, relate to 48K ZX Spectrum versions. Our software is available for many other Z80 machines e.g. Amstrad CPC 464, MSX, Memotech, SHARP MZ700, New-Brain, CP/M etc. Please write for details.

FAST AND FURIOUS

SLAPSHOT

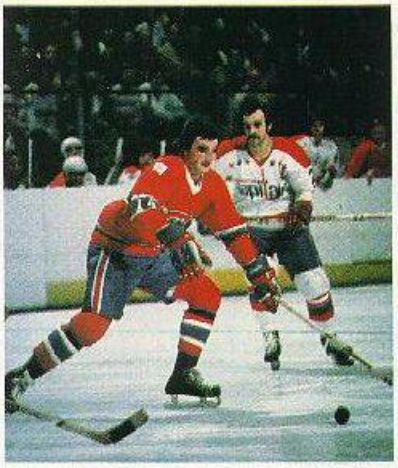
ANIROG

SPEECH
No Hardware Required



ALL ACTION ICE HOCKEY

SLAPSHOT from Anirog is a two player, fast action, ice hockey program. Also in this thrilling game there is included a smoothly running speech synthesis system of the very highest quality. Before the actual game starts each player must select an international hockey team to represent. After doing this you must quickly and skilfully manoeuvre your man across the glistening ice whilst your other team-mates move automatically around the rink waiting for you to pass the puck to them. If you do manage to race past the opposing defence then you have a chance to shoot for goal and score. However, you still have the goalie to beat who is able to dive in all directions. Also included in this amazingly quick and totally original game is the ability to actually physically bodycheck your opponents. Never the less, do not be too aggressive otherwise you could incur a "roughing penalty", resulting in a faceoff in your own end, giving the opposing side an easy chance of scoring. Also other extra features available include: Pause mode, and three levels of play ranging from fast to slow as well as a re-start option. Slapshot from Anirog is a totally original two player game with lightning fast action never seen before on the Commodore 64.



Two J.S. Commodore 64 Cassette £8.95 Disk £10.95

Trade Enquiries: ANIROG SOFTWARE LTD. UNIT 10 VICTORIA IND. PARK VICTORIA ROAD DARTFORD KENT (0322)92513/8
Mail Order: 8 HIGH STREET HORLEY SURREY 24 HOUR CREDIT SALES HORLEY 02934 6083

THE REVIEWERS ARE RAVING!..

GIFT FROM THE GODS

Pick of the week

A gift from the Unique strategy adventure

Likely to be the big hit of 1985.

SPECTRUM 48K 9.95

ocean

Ocean House · 6 Central Street · Manchester · M2 5NS · Telephone 061 832 6633 · Telex 669977

Ocean Software is available from selected branches of: WOOLWORTH, WHSMITH, Boots, John Menzies, LASKYS, Rumbelows, COMET

Spectrum Shops and all good software dealers. Trace enquiries welcome.